AMERICAN GAS JOURNAL

OCTOBER 1939

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Even as the Famed Knights of Old in Legends Bold — Protected and Safe-Guarded the Citizenry — So do REYNOLDS Regulators protect and guard Homes and Industries of today.

Since 1892 REYNOLDS has constantly devoted every available means to maintain the high character of its products — in design and manufacture — and to extend the range of their application.

In the Gas Control Field for nearly half a century, the name REYNOLDS has been the standard of comparison — so recognized by the Gas Industry.

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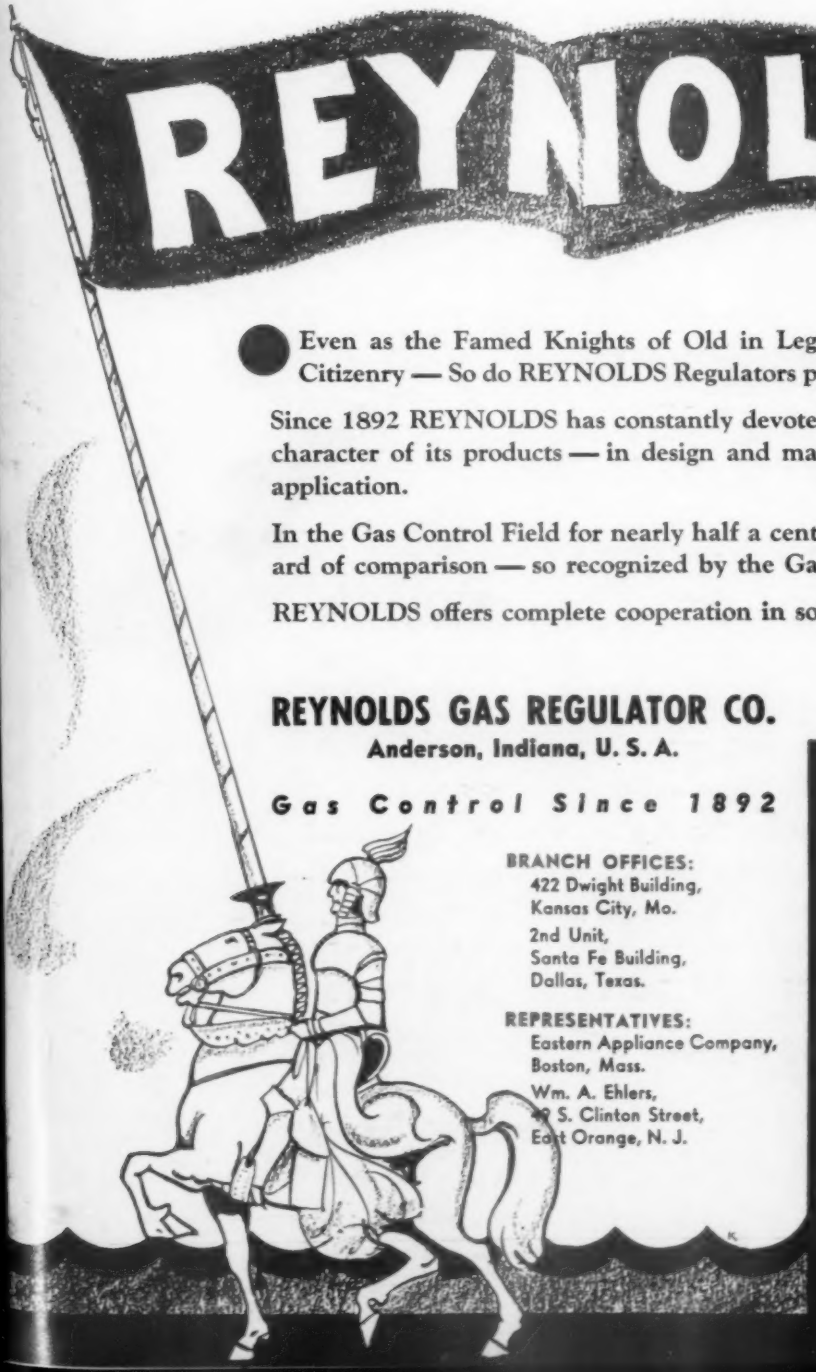

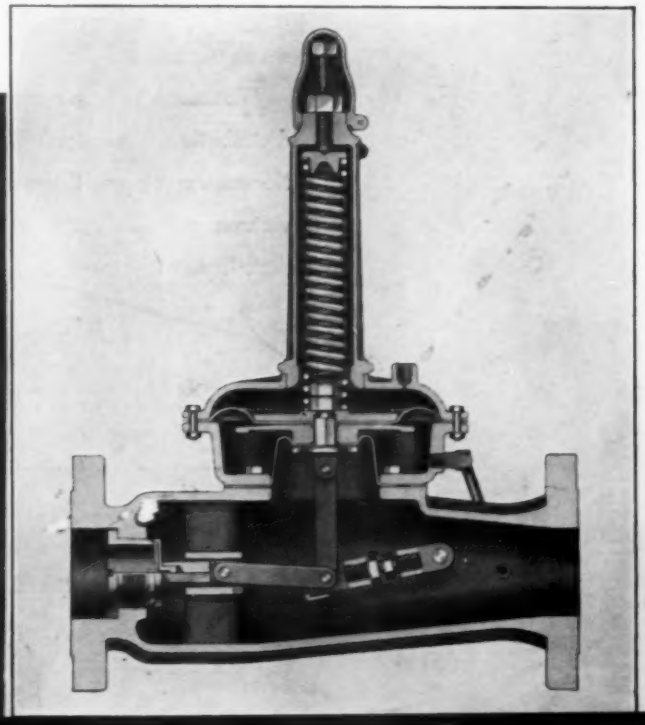

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AT THE NEW YORK WORLD'S FAIR

Throughout the distribution system serving the New York World's Fair, Nordstrom Lubricated Plug Valves are used 100%. The District Governors are EMCO Low Pressure Balanced Valve Regulators. Many of the services are metered by EMCO No. 4½ and No. 5 Pressed Steel Meters. This modern equipment is readily accessible for gas men to view while visiting the World's Fair.

OUT FRONT . . . ROMANCE AND GLAMOUR
BEHIND THE SCENES . . . STURDY WORK-A-DAY EQUIPMENT

To insure the beauty and enjoyment of the New York World's Fair to millions of people there must be continually working and ever vigilant sentinels behind the scenes on the utility companies' services

To insure accurate measurement, correct pressure control and perfect distribution conditions EMCO Meters and Regulators are teamed with Nordstrom Valves throughout the Gas distribution system. Those same virtues, so readily appreciated in the less exciting atmosphere of normal distribution systems, are fully exploited at the New York World's Fair.

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AMERICAN GAS JOURNAL, October, 1939. Vol. 151, No. 4. Published monthly by American Gas Journal, Inc., at 34 North Crystal St., East Stroudsburg, Pa. Executive and Editorial offices at 53 Park Place, New York, N. Y. Entered as second-class matter, October 7, 1928, at the post office at East Stroudsburg, Pa., under the Act of March 3, 1879.

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Versatility

Sums Up the Amazing Acceptance of

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1 Equally valuable for both new and conversion installation.

2 Produces uniform gas of required specifications.

3 Either Coke or Bituminous Coal in desired proportions up to 100% of either fuel can be used as generator fuel . . . depending on the economics of the individual situation.

4 Quality of carbureting oil may be selected to suit market conditions, comparable operating efficiencies being maintained.

In less than two years, REVERSE FLOW'S all-round efficiency has won the gas industry's emphatic approval—because of its *exclusive 4-Way VERSATILITY.*

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REVERSE FLOW represents the first major improvement in gas manufacture in the past decade. We believe it is destined to replace so-called "standard" operation.

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ENGINEERING CORPORATION

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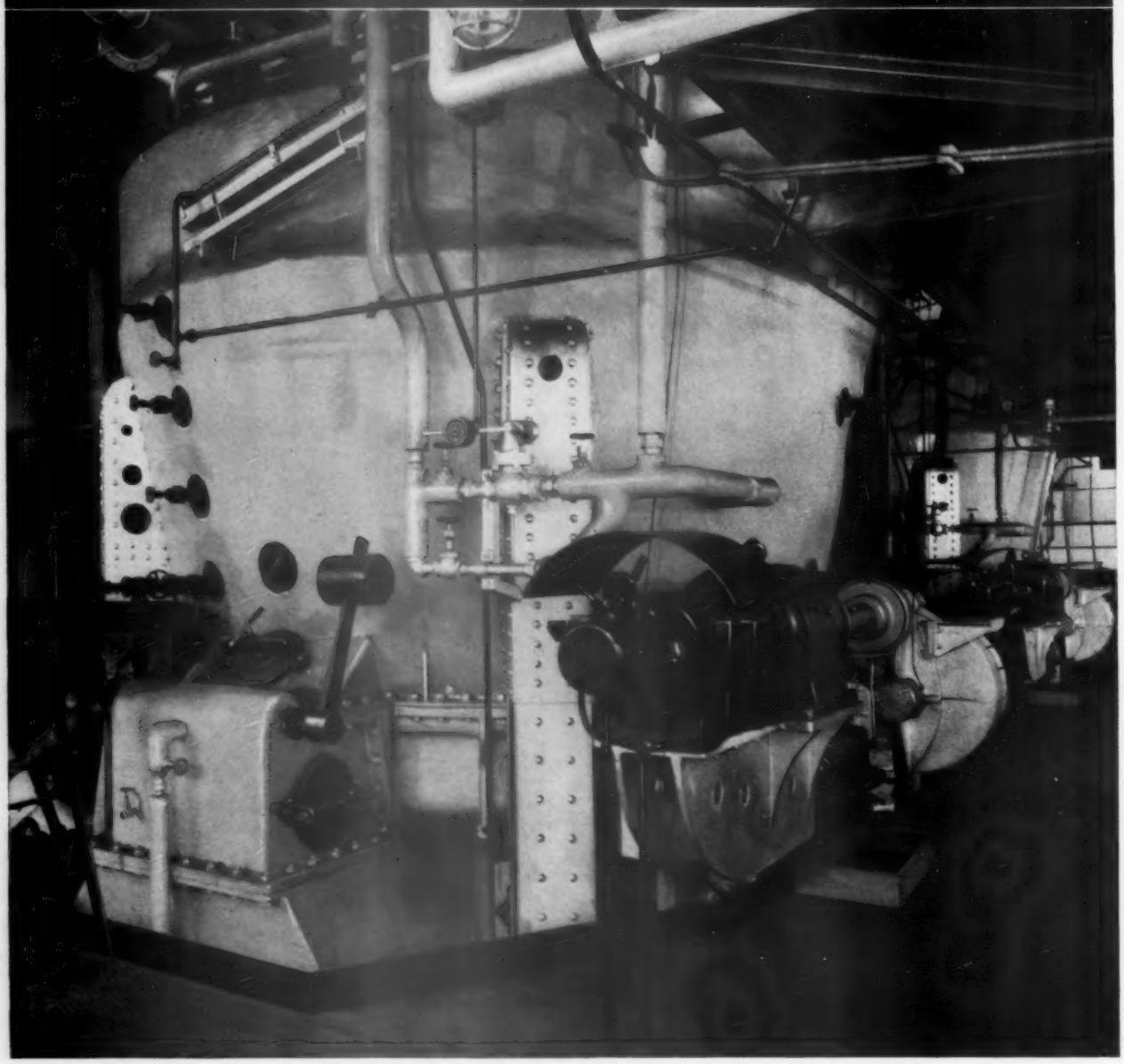

U. G. I. Mechanical Generator Water Gas Sets plus modern and efficient gas and fuel handling apparatus assure economical gas production.

U. G. I. Heavy Oil Process provides for use of low cost enricher. Long operating experience with use of heavy oil insures satisfactory operation with utmost economy. Now in use on over one hundred water gas sets.

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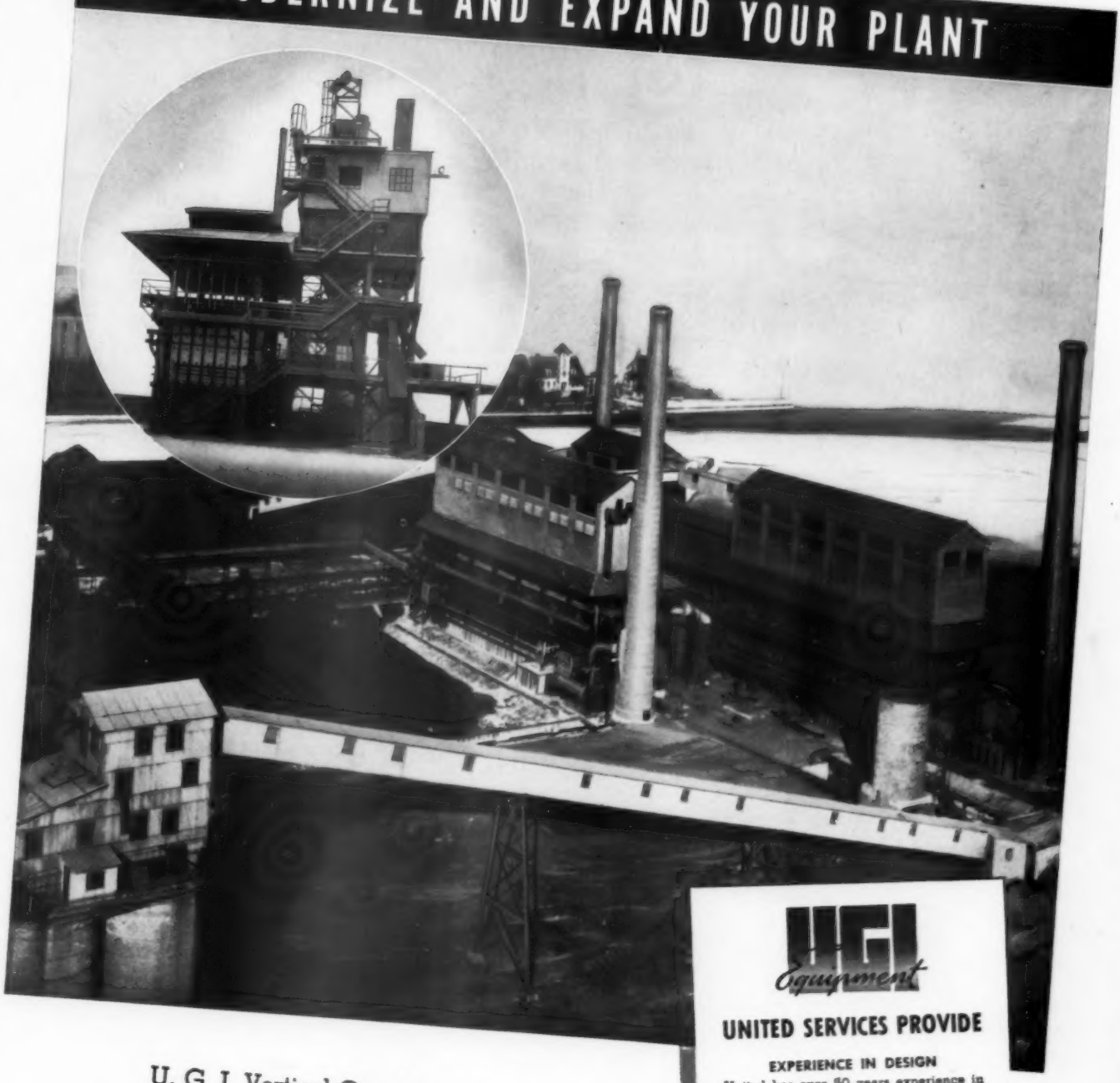

U. G. I. Vertical Ovens give large gas capacity per ton of coke produced and low conversion cost per Mcf of gas made. Adaptable to large and small plants.

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United has over 50 years experience in gas plant design.

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United has large well organized forces for gas plant and general construction work.

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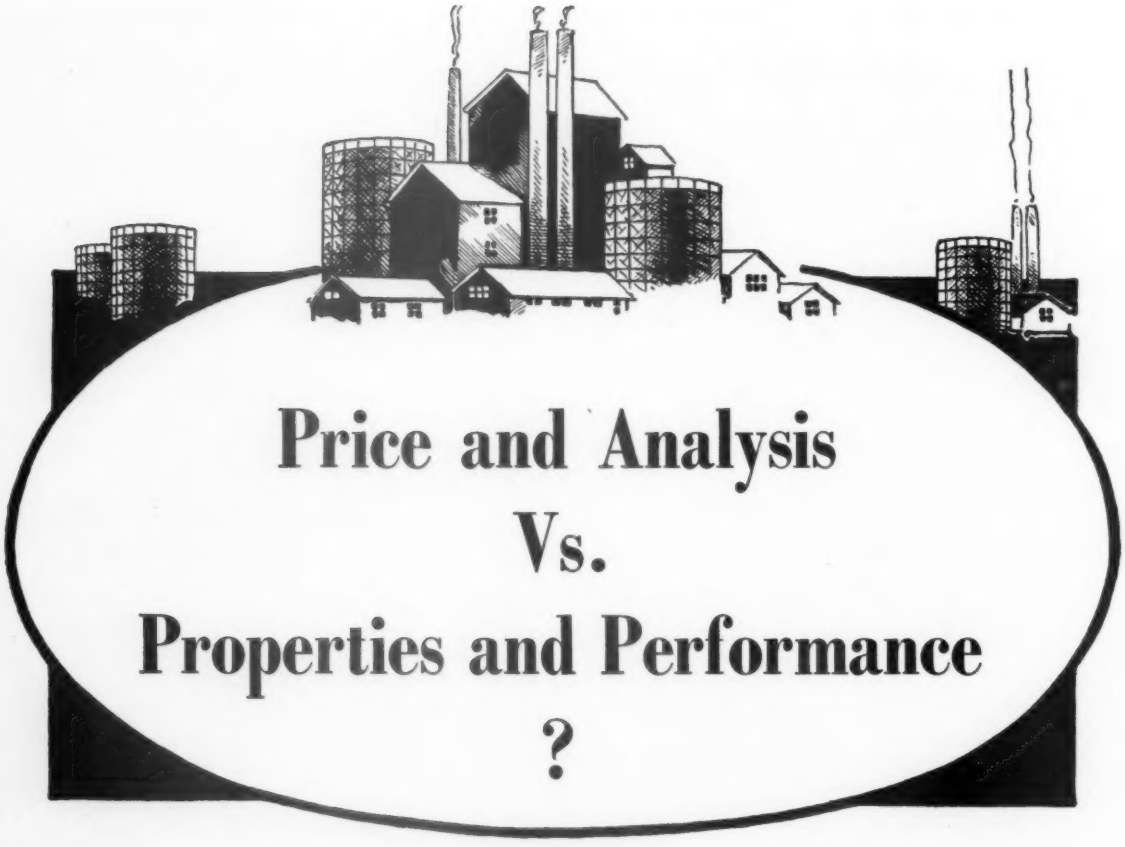

Price and Analysis Vs. Properties and Performance ?

CROZER PREMIX STOKER Admiralty Coal DENDRON STONEGA RODA WESTMORELAND COAL COMPANY CRITERION COAL

OF what advantage is a favorable price if the performance fails to meet either requirements or expectations?

What can be gained in a favorable analysis if the properties do not produce results that are satisfactory?

An unbroken record of uniform performance has established a reputation for General Coals that merits your serious consideration.

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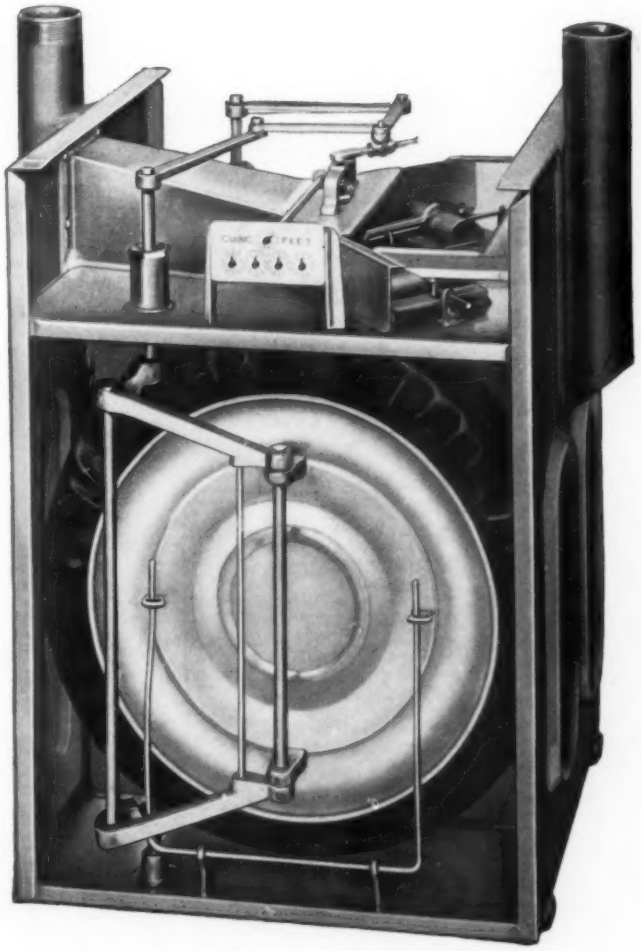
SUPERIOR leads the way with a meter designed especially for the rapidly increasing industrial and house-heating loads. It is the new improved SUPERIOR "C", combining the large capacity of the "A" meter, the slow motion of the "B" meter with many new, exclusive features.

Fewer moving parts, unusually heavy flag construction, smaller bearing surfaces, and a high ratio of capacity to space occupied make the SUPERIOR "C" the modern method of efficient, accurate, and quiet metering of large loads, whether intermittent or continuous. A glance at the cut on the right will show you the simple but rugged construction that speaks for itself.



You will find a SUPERIOR "C" Meter to serve your purposes for all sizes of industrial and house heating loads. They are made in five sizes—6C-600 cu. ft., 11C-1100 cu. ft., 25C-2500 cu. ft., 40C-4000 cu. ft., 60C-6000 cu. ft., capacity per hour.

Wet Test and Demonstration Meters
Diaphragms—Service Cleaners
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A word about our other meters:—

Every SUPERIOR Meter from 5B up is built upon the tradition that quality comes first. They are constructed from the best of materials by an experienced staff of meter mechanics. The name, SUPERIOR, means more accuracy, less trouble, and fewer expensive repairs. All sizes, 5B to 60C.

The new bulletin, #23, gives full facts about SUPERIOR Meters and shows why we enjoy an increasing volume of repeat orders from most of the large utilities. Write for it.

SUPERIOR METER COMPANY, INC.

167 41st Street ***Brooklyn, N. Y.***

Continued Vitality *for the* Gas Industry

SINCE 1816, when the first gas plant in this country was built at Baltimore, the industry has made noteworthy progress. Its continued vitality is indicated by the attainment, in 1938, of 17,135,000 customers—the largest number ever served.

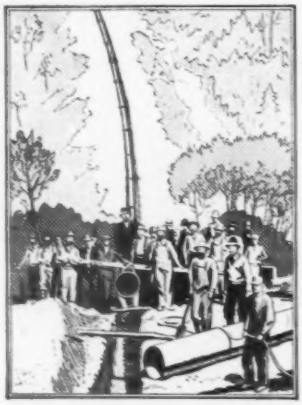
Today, both manufactured and natural gas are made available to cities, towns, villages and hamlets having a combined population of some 81,000,000. To serve these consumers, representing approximately three-fifths of all the nation's households, requires an investment in plant and equipment of nearly $5,000,000,000.

It is worthy of note that at present nearly three-quarters of all our national gas consumption is derived from natural sources.

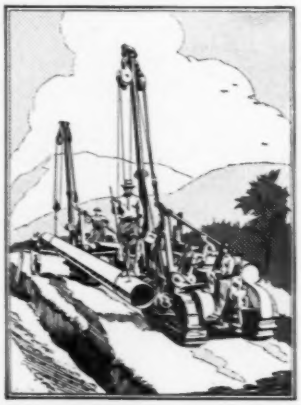
The estimated total natural gas production last year, including the amount used in non-utility sales, was two and one-half trillion cubic feet—approximately six times the comparable figure twenty-five years earlier.

Columbia System companies extend their operations through Ohio, Indiana, Kentucky, West Virginia, Pennsylvania, Maryland and New York. Fed by vast reserves, a network of interconnecting pipe lines supplies reliable gas to more than 1,100,000 consumers. In addition, these operating units provide electric service to some 350,000 customers.

The gas and electric energy thus furnished—economically and abundantly—emphasizes the basic importance of these essential utilities. When applied to raw materials, by modern production methods, this energy converts them into goods finding a ready market in the United States and in many foreign lands.



A section of line being laid more than 25 years ago in the natural gas fields of southern West Virginia



In striking contrast is this modern method of laying natural gas pipe lines for long distance transmission

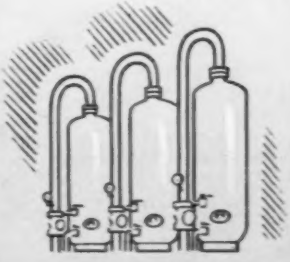
COLUMBIA SYSTEM

COLUMBIA GAS & ELECTRIC CORPORATION

NOW GAS IS DOING OUR "Four big jobs" TOO!

CLEAN GAS MAKES SATISFIED CUSTOMERS

That's how customer satisfaction grows ! First she used gas for cooking; then—in order—for refrigeration, automatic water heating and house heating. But if the gas had failed her, do you think she would have extended its use? On the basis of increased consumer satisfaction alone, you are warranted in installing Blaw-Knox Gas Cleaners. In addition to insured continuity of service they give you many values . . . protection of compressors from the erosive effects of scale and sand; increased accuracy in metering; prevention of damage by dirt and rust. Blaw-Knox catalog No. 1581 tells the whole story. Ask for it.



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BLAW-KNOX DIVISION of Blaw-Knox Company · FARMERS BANK BLDG. · PITTSBURGH, PA.

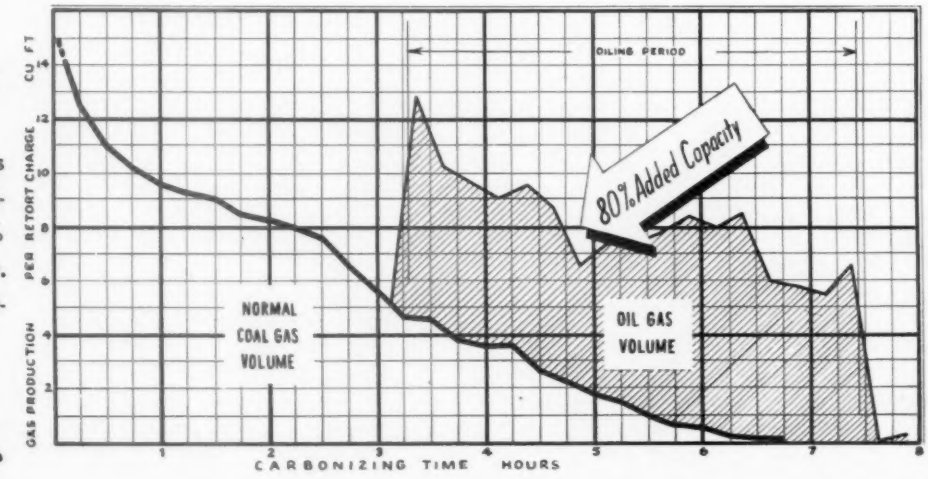
Meet Peak Load Periods With The Retort Oil Gas Process

Don't delay to investigate this profitable process which will meet fuel competition during the coming peak load periods.

Among its advantages are:

1. Low investment cost per MCF of added capacity.
2. Satisfactory substitute gas produced.
3. Residual coke production balanced with coke sales demand.
4. Only steam and oil used.
5. Quick starting, simple to operate.
6. Reduction of benches in service.
7. No added labor cost.

The adjoining graph is that of actual operation. It shows an 80% increase in capacity. —and here is the operating record.



- Capacity increases of 50,000-55,000 cu. ft. per bench day on benches of 9'-3" stop-ends and 11'-6" thru 6's.
- Gas Oil per MCF oil gas made..5.35 to 5.8 gals.
- Steam per MCF oil gas made.....30-35 lbs.
- Steam pressure required.....15 lbs. or more
- Bench fuel per MCF oil gas made....6 to 8 lbs.
- Coal gas tar unimpaired

Builders of Improved Horizontal Gas Ovens,—Retort Benches,—Unit Type Ovens,—Unit-System Vertical Retort Benches,—Complete Coal Gas Plants,—Coal Gas Plant Equipment,—Charging and Discharging Machines.

The coming increased costs of materials and labor for gas production can be offset by a prompt maintenance program. Your inquiries will have our careful attention.

Combustion Utilities Corporation

IMPROVED EQUIPMENT — RUSSELL ENGINEERING DIVISION

60 WALL STREET **NEW YORK, N. Y.**

OCT 19 1939

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VOLUME 151
NUMBER 4

AMERICAN GAS JOURNAL

WHOLE
NUMBER 3790

ESTABLISHED 1859

OCTOBER, 1939

PUBLISHED MONTHLY BY
AMERICAN GAS JOURNAL, Inc.
53 Park Place, New York

S. G. KRAKE, *President and Treasurer*
M. E. KELLEHER, *Secretary*
A. I. PHILLIPS, *Editorial Director*
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168 N. Michigan Ave.
Chicago, Ill.

Copyright 1939, American Gas Journal, Inc.

Subscription $2.00 per year U.S.A.; $3.00 Canada; $4.00 Foreign. Single copies, 25 cts.

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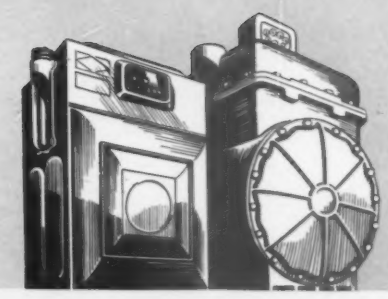
Laboratory controlled ... precision built



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AMERICAN METER COMPANY

INCORPORATED (ESTABLISHED 1836)

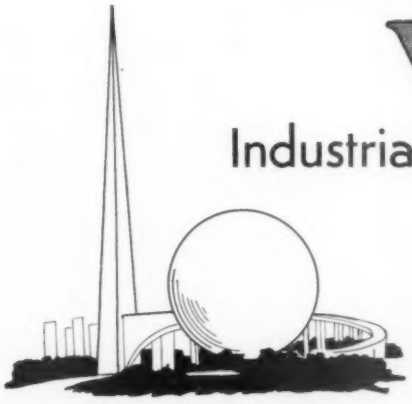
OCTOBER
1939

AMERICAN
GAS JOURNAL

VOLUME 151
No. 4

Gas at New York World's Fair

Industrial, Commercial and Domestic Uses



Gas, it may well be said is working overtime at the New York World's Fair. It is cooking frankfurters, heating baby incubators, roasting coffee, baking bread and helping to make automobile tires. It has been chosen by Fair officials for cooking, water heating and space heating in all of the Fair Corporation buildings and in all of the permanent buildings which will remain after the exposition is over. It is being used for steam generation, bread and cake baking, pottery firing, sterilizing and refrigeration. Gas equipment is in use throughout the Fair in restaurants, in industrial buildings, and for virtually all of the industrial processing work of exhibitors.

The selection of gas for all these varied uses has been made on the basis of its automatic, efficient heat, its adaptability to work requiring complicated precision; its wide fluctuation of heat; its continuity of supply. There are more than 2500 gas appliances in use at the Fair.

Firestone Tire and Rubber Company's modern factory where tires are turned out at the rate of 1 every 4 minutes. Gas fired boilers provide the steam used in many of the main processes.

Swift & Company's gas heated smoke houses that simultaneously cook and smoke frankfurters for Fair appetites.

Borden's "The Dairy World of Tomorrow" where a battery of five gas water-heating units supply all the hot water for cleaning and sterilizing. In another part of the building, 2 steam boilers furnish the hot water for the two Borden-operated restaurants.

Many uses of gas at the New York World's Fair have been described in our issues of April, June and July including complete description of exhibits in the Gas Industries Building. A partial summary of uses is given here along with some additional outstanding industrial uses.

The gas-fired water heater and steam boiler equipment in the refreshment exhibit used for bottle-washing.

The automatic gas-fired water heating equipment which supplies the heat for Dr. Martin A. Couney's hospital for premature infants,—The Baby Incubators in the Amusement Area.

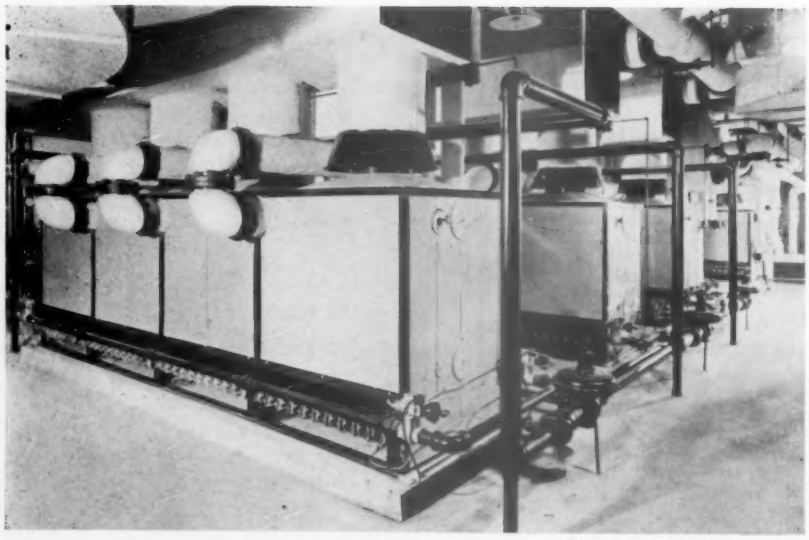
The all-gas kitchen of the Gas Industries' "Court of Flame" Restaurant, where gas is used for everything but squeezing oranges, etc.! Eight Servel Electrolux commercial units are installed here for refrigeration. (Two other restaurants at the Fair which have selected commercial gas refrigerators (Servel) are the Swedish-American Line's restaurant in the Swedish Pavilion, and Standard Brands.)

The permanent City of New York Building, which has one of the largest gas-designed heating installations in the country. The heating plant in this building uses 3 boilers, totalling 400 horsepower. These supply steam to duct heaters.

Gas fuel is heating water in restaurants and buildings throughout the Fair. An average of 500,000 gallons of water are being heated every day. (One manufacturer has no less than 126 units installed.) This represents an almost all-inclusive coverage, other means than automatic gas fuel being utilized in only two or three instances.

Gas for cooking, as has been indicated, looms prominent on the Fair horizon for gas equipment is to be seen in every public restaurant, sandwich bar and food stand in the exposition.

The entire Court of States area is illuminated by gas; decorative gas flares light various parts of the Fair grounds. The Business Systems



One of the largest gas heating installation in the United States is in the City of New York Building. Three heating units each with A.G.A. rating of 16,000 feet of steam. In the background a water heating boiler A.G.A. rating 7200 square feet, 51.6 H.P. to heat 3500 gallons of water per hour.

building also utilizes gas for illuminating in a novel way. Particularly spectacular is the Gas Industries' building with its 90-foot pylons "faced" with streamers of flame; its huge glass cube belching a flame torch; its picturesque "flambeaux" resembling ancient Grecian urns, that burn wide yellow ribbon-flame.

The Gas Industries building introduces another innovation with its recessed gas lighting in ceiling fixtures, none of which hang below the level of the ceiling. In the ring-like roof encircling the "Court of Flame," the courtyard entrance to the Gas Industries building, are recessed four architecturally-designed gas burning fixtures forty inches in diameter.

The Town of Tomorrow

The Town of Tomorrow, near the main entrance consists of a community of 15 demonstration homes exemplifying the proper use of building materials, home equipment, and home furnishings.

Having the familiar look of a typical new development in a suburban town, with beautifullly landscaped gardens and winding streets, this group of houses is one of the most interesting spots at the Fair. It is sponsored by the building materials trade, with each home decorated and furnished by leading department and furniture stores.

House No. 6 is known as "The Small Home of Wood," and is valued at approximately $3,000. This is one of the official A.G.A. all-gas houses.

House No. 15 is known as "The Johns - Manville Triple - Insulated House," and is sponsored by the Johns-Manville Corp. This is also an A.G.A. all-gas home, and is valued at approximately $9,000.

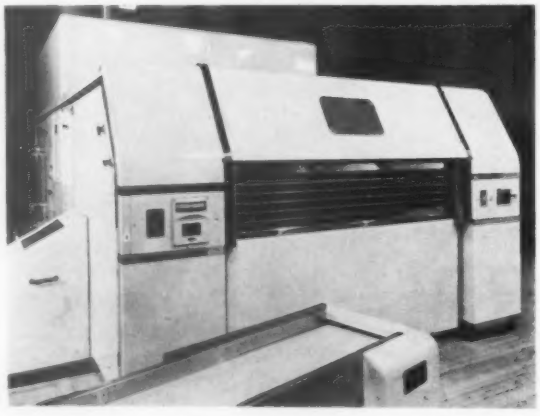
Wonder Bakery

At the Continental Baking Company exhibit may be seen a modern type of Baker-Perkins single lap diathermatic gas-fired tray oven having 25 trays measuring 12¼" x 6' 4".

Accurate automatic control is attained by the use of a single "on-off" gas burner. The flame is produced in a tile lined firing chamber, the products of combustion being recirculated within a totally enclosed system composed of ducts and radiators.

Recirculation of the gases increases the efficiency of the heating system and their high velocity throughout the system makes for uniform rapid heat transfer.

The firing chamber, ducts, and radiators within the baking chamber operate under sub-atmospheric pressure. A B-P nozzle mixing burner is employed and the suction used to entrain both air and gas. Regulating sleeves regulate the proper proportions after the gas has been reduced to near atmospheric pressure by a regulating governor. The main



Front view of Wonder Bakery Oven. Circulating fan is housed on the left behind which is the gas burner and regulator. On the extreme right are the controls for temperature and time. In the foreground, the conveyor to air conditioned cooler to prepare loaves for wrapping.

This gay and attractive kitchen is in House No. 8 (Colonial Home). The gas range is an "Oriole" with divided center top and heated warming oven.

flame is ignited directly by the use of electric ignition and protected against failure by standard protective devices.

The gas system consists of a number of ribbon type burners placed in the baking chamber. Air is supplied to inspirators under pressure sufficient to entrain and mix with the gas.

The burners are also electrically ignited and are inter-connected so that current failure will result in a safety shut-down.

The glass tower of the building, visible from every part of the Fair is one of the most beautiful on the grounds, particularly at night when the unusual lighting effects enhance its appearance. The tower is constructed from glass blocks set off by blue plate glass fins, and on one side a metal helix runs from top to bottom. This helix is outlined by high voltage, blue, fluorescent tubing. The tower itself is illuminated from within by more than 2,200 daylight type incandescent lamps (varying from 25 to 100 watts) and provides a good landmark for the stranger at the Fair.

Atop the tower are twelve 10,000 lumen sodium lamps which produce a beautiful golden light, thus forming a pleasing contrast with the blue of the fluorescent tube and of the glass fins.

Rather surprisingly perhaps, this building, constructed largely of structural steel and glass, is one of the most permanent on the Fair Grounds. It is located on the Avenue of Pioneers at the very heart of the Fair area, within the shadow of the thematic Trylon and Perisphere.

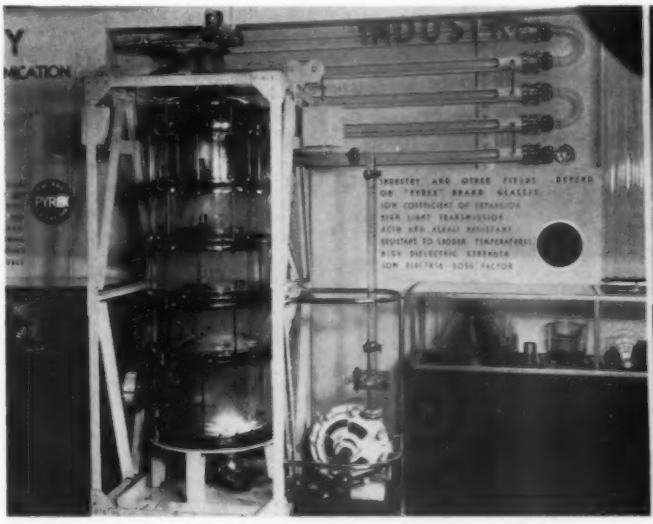
In the main Rotunda at the rear of the demonstration platform are two gas furnaces,—the melting furnace and the "Glory Hole." The latter is used from time to time for reheating the work during the blowing operation.

The Melting Tank is 6′ long, 2′ wide, 2′ from the top of the glass to the spring of the arch and has a capacity of approximately one ton of melted glass. This unit is of typical construction with Silica Refractory on the inner walls and is fired with one No. 90 HE McKee Entrainment Gas Burner having a maximum demand of 2600 cu. ft. 540 B. T. U. gas hourly.

The gas is brought into this building under a pressure of 1 to 5 pounds and is reduced through a regulator at the head of the meters to a pressure of 4″. The gas piping then extends over to the furnace where the gas is fed through a 3″ McKee Dual-Lock Valve and a Zero Governor to the burner. Air is supplied from a No. 3619-3 McKee Pressure Blower direct connected to a 3450 RPM 3 phase motor operating against a static pressure of 16 oz. The gas supply passing through the Dual-Lock Valve is given full protection against either gas or electric failure. The first of the two valves is held open by air pressure from the blower and the second by the gas pressure beneath the diaphragm. The gas then passes on to the Zero Governor where it is reduced to zero or atmospheric pressure.

The main air supply from the blower is delivered to the air connection on the burner. The air passing through the burner expands in a Venturi throat and entrains the proper amount of gas. The mixture through this burner is kept slightly on the rich side; and additional air to complete the combustion and give an oxidizing atmosphere is supplied through a separate pipe beneath the burner, both being controlled by one air blast gate. The turn down range on this burner is particularly large, it has a high velocity and develops sufficient luminosity to prevent any unfused materials from remaining in the glass bath.

Extreme care was taken in heating this furnace from cold, and it has



Pyrex Glass Fractionating Column in operation.

Glass Melting Furnace and "Glory Hole."

This tray type oven is the type used nationally in medium sized plants. Loading and unloading are carried out at the front of the oven which is maintained at about 480°F. with a baking cycle of 30 minutes. Five hundred 21 oz. loaves of bread per hour are produced at this installation.

The Glass Center

Acclaimed by all as one of the most outstanding features of the New York World's Fair, the million dollar Glass Center, where three of the country's leading glass producers, Corning Glass Works, Owens-Illinois Glass Co. and Pittsburgh Plate Glass Co. are jointly exhibiting, presents a vivid picture of the use of gas in a vital industry. Here the small boy, the scientist and the ordinary human being and his wife will all be tempted to linger and to come back again for another look at those wizards who can take a shapeless mass of molten material on the end of a pipe from a gas heated furnace and in no time before your eyes fashion a thing of grace and beauty.

required only slight maintenance.

Gas does a particularly nice job here due to its controllability and cleanliness, uniform temperature and clear glass resulting. There is also supplied an additional burner of the atmospheric or box type which can be used to keep the glass in a molten state, should temporary power failure occur.

During the process of blowing the glass, there are times when the material requires reheating in order to maintain its flexibility. This is accomplished with a "Glory Hole" having a maximum demand of 1400 cu. ft. of gas hourly. Air is supplied to the burner on this furnace at a pressure of approximately 12 oz. A two valve mixing system is used.

After the glass has been partly blown, it is only necessary for the operator to insert the blow pipe on which the glass is attached into the Glory Hole for a few seconds. The temperature is reobtained allowing the glass to stay in flexible condition until the blowing operation is complete.

In another section of the building there is a continuous fiber glass machine making minute strands of glass which are later spun into threads and woven before your eyes into fabrics and electric insulation in standard type looms.

In the Libbey Glass section, the feature that has made this company the leader in its field—the Safedge rim on its glasses—is demonstrated. For the first time the public is being shown how the Safedge is formed in a special machine by a gas flame which cuts off the surplus material, rounds the edge and anneals it so that its resistance to shock is increased sevenfold.

Other features of interest to gas men will be found in this exhibit of an industry which buys millions of cubic feet of gas from us each year. It is a far cry from high grade chemical laboratory equipment to glass wool for heat insulating purposes* but they will both be found at the Glass Center.

The American Potter Exhibit

Located in the Home Furnishings Building, opposite the Gas Industry Building, the American Potter Exhibit will be of particular interest to gas men because of the gas heated tunnel kiln which is used to fire the pottery made there by master craftsmen.

Unique also is the fact that this exhibit is a joint enterprise of capital and labor. One half of the cost of the exhibit is being paid by the National Brotherhood of Operative Potters, an American Federation of Labor affiliate with headquarters in East Liverpool, Ohio, which for 40 years has successfully piloted labor's interest through the medium of collective bargaining. We understand that the money has come from an unneeded strike fund.

The balance of the cost is being defrayed by

The Cronin China Company of Minerva, Ohio, producers of dinnerware, ovenware, etc.; The Hall China Company of East Liverpool, Ohio, an outstanding manufacturer of teapots and kitchen ware; The Edwin M. Knowles China Company, East Liverpool, Ohio, famous for its high grade dinnerware; The Homer Laughlin China Company, Newell, West Virginia, the world's largest manufacturer of dinnerware, and The Paden City Pottery Company of Paden City, West Virginia, producers of popular styles of dinnerware.

The display is in fact a miniature working pottery, producing hand thrown vases, potter's wheel embossed plates and molded jugs.

Muffle Type Tunnel Kiln at Pottery Exhibit.

Clay, prepared in advance, is delivered to the exhibit, where in the case of the vases and plates it is put on the potters' wheels. The vases are formed entirely by hand while the plates take their shape from the face of the wheel and from the tool which is used to form the bottom. After forming they are allowed to dry and harden for about 12 hours and are then fired in the kiln for 12 hours and 40 minutes at a maximum temperature of 2100° F. This represents a radical departure from usual practice, which is about 32 hours.

The ware, which comes from the ovens hard, white and lusterless, is known as bisque. This is then dipped in a compound which on refiring at 1900° F. gives the desired color and a finish which is essentially glass. This is known as "glost."

For making shapes that are not round, or that are decorated with relief ornamentation, such as the jug, the so-called casting process is employed. Here the clay body is prepared as a heavy liquid slip which is poured into the porous plaster mold, allowed to remain there until a sufficiently thick wall has been formed by absorption of water into the mold. The excess slip is then drained out and the remaining clay allowed to dry and harden. It is then fired as already described.

The muffle type tunnel kiln, built by the Allied Engineering Company of Cleveland, Ohio, represents the most modern practice in use commercially today. The kiln is a gas fired muffle type and is a faithful miniature of full size production models.

In general, the kiln is a circular tunnel through which the pottery is carried on a revolving table; preheating taking place in the first part, soaking or maturing in the hottest part located approximately midway of the tunnel and cooling toward the exit end. Part of the circle is open so material may be loaded and unloaded conveniently. Products of combustion are conducted through muffle chambers along each side of the ware chamber, in an opposite direction to the passage of ware. Heat transfer from hot combustion gases takes place through very thin refractory partitions called muffles, to the ware. Heat economy is obtained by utilizing the cooler combustion gases for preheating the pottery. Various dampers and controls permit all types of pottery to be fired with maximum uniformity and efficiency.

* *Elsewhere in this issue mention is made of the use of glass wool for insulating tar and heavy oil tanks at Portland (Maine) gas works.*

The burner equipment is specially designed for accurate control of combustion of gas, both as to gas, air mixture and flame length. Primary air for combustion is provided by a low pressure blower at a pressure of 8 ounces; while gas is supplied through a regulator at about 4 ounces. Located at each burner is a cross connected governor so arranged that the gas pressure is throttled to exactly match the air pressure at the burner and both can be checked by gauges on the burner. With such an arrangement the heat input from each burner can be controlled by means of the air valve alone while flame length and gas, air mixture remaining constant. Temperature in the entire furnace is automatically controlled by a specially designed air valve located in the main air line; this being actuated by a pyrometer controller and thermocouple placed in the furnace. Temperature gradients through the ware tunnel are varied by the output of each burner, five of which are used.

Output from this miniature commercial unit is approximately 1350 pieces per day for seven days per week. Operation is continuous 24 hours each day although constant attention is not required as long as the pottery is loaded and unloaded when required. Normally, dinnerware is heated or fired three separate times; the first fire producing what is known as bisque or unglazed ware, the second fire producing glost or glazed material and the third the final decorated pieces. Since no decorated ware is being produced at the fair, only two separate fires are required, and both are being carried on in the one kiln. For a few days, bisque ware is produced at a temperature of about 2100° F., then the automatic control is set for a lower temperature and the pieces previously fired are glazed and finished.

The exhibit is remarkable in that commercial processing is done in all respects the same as in normal factory operation, the kiln operating continuously and the other equipment throughout the day. A thoroughly dependable supply of fuel is thus essential; and gas, therefore, contributes much to the success of the display.

The Lagoon Fountains

Of considerable interest is the pumping equipment for the fountains at the Lagoon of Nations where gas flares in colors mingle with water, fireworks and sound in blended chaos.

Housed in a glass enclosed rotunda directly in front of the Rumanian Building at the south end of the Lagoon are eleven Worthington rotary pumps direct connected to Westinghouse Motors.

These pumps when operating at maximum capacity have a total output of 280 tons of water per minute. Twenty tons of water are suspended in the air at one time under full operation. The center jet operates at a pressure of 350 foot head throwing a jet about 190 feet high. The two end jets operate at pressure of 260 foot head.

Gas flares, water, lighting, fireworks and sound are all operated from a control room in the Rumanian Building where three control boards are employed.

This nightly spectacle is viewed by tens of thousands each evening who gather in the wide open space completely surrounding the lagoon. An even better view is had by those who patronize the restaurants of the French and the Belgian pavilions or occupy points of vantage on the stairways and balconies of the British pavilion.

Partlow Pilots

at

New York World's Fair

The "Lagoon of Nations",—a mammoth display of water, sound, light and flame,—has been proclaimed the outstanding spectacle at the Fair. No doubt, you will wonder how the 133 gigantic gas burners, distributed throughout the Lagoon, are ignited, in the torrential deluge of 280 tons of water per minute, and accompanying spray. The secret lies in the specially designed Partlow "Donald Duck" Pilots, attached to each burner,—an outstanding Partlow achievement.

Close-up of one of the three giant center color flame burners in middle of main fountain. Note compactness of installation.

Close-up of one battery of six units of the center ring of 72 color flame burners, pilots, color chemical cylinders, rectangular transformer boxes, motor valves and pilot solenoids.

Obscured from direct public gaze are numerous other Partlow pilots, throughout the Fair. Notable are those for igniting the flares surrounding the Gas Industries Bldg., and the four 90 ft. pylons at the Court of Flames. All other open gas flames are also Partlow ignited, including the Bridges of Wheels and Wings, and I.R.T.-B.M.T. Ramp.

There are many interesting Partlow Temperature Control applications plainly visible. Notable are those in the Food Bldg. North; Food Bldg. South; Drake Bakery; Children's World; DuPont Bldg.; Ford Bldg.; Hall of Industrial Science and others.

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Offices in Principal Cities.

WELCOME A.G.A.

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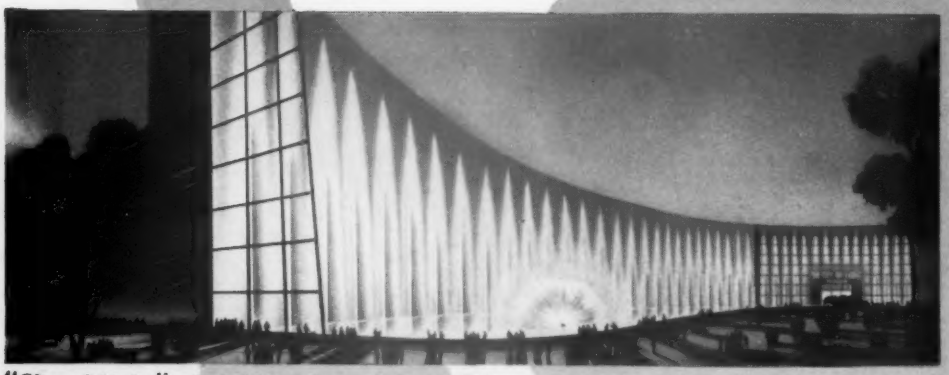


"City of Light"—Exhibit of Consolidated Edison at the New York World's Fair—1939

©N.Y.W.F.

CONSOLIDATED EDISON is pleased and honored to be one of your host companies in welcoming the gas industry to the 21st Annual Convention of the American Gas Association.

The New York World's Fair, which is the occasion that brings the A. G. A. Convention to New York City this year, is of particular interest to all gas-minded men and women.

Speaking to more than 20,000 Consolidated employees at the Fair Grounds a few weeks ago, Ralph H. Tapscott, President of this company, pointed out that, "In terms of energy, or B.t.u.'s, actually more work at this Fair is done by gas than by electricity."

Gas was the fuel selected by a total of 211 exhibitors, concessionaires, etc., representing 87.2% of all buildings and comprising the use of 3,249 separate pieces of gas-fired equipment.

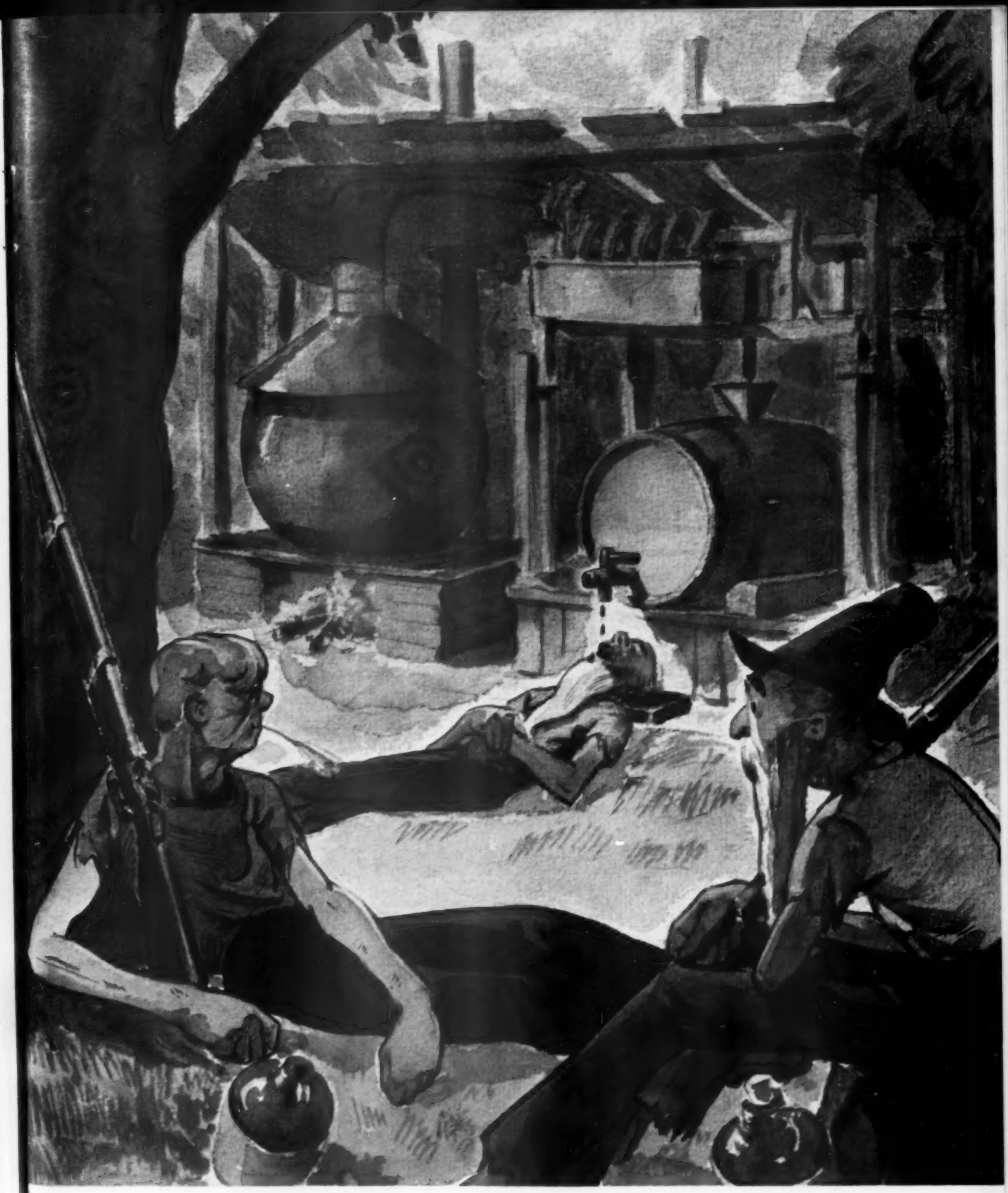
This, added to the fact that one of the most striking exhibits at the Fair is that of the Gas Industries Building, should be a source of the greatest encouragement to the gas business.

There is no question today of the important part that gas will play in the "World of Tomorrow."

Consolidated Edison uses this means to urge a thorough inspection of the New York World's Fair and to assure a warm welcome at its own exhibit building "The City of Light."

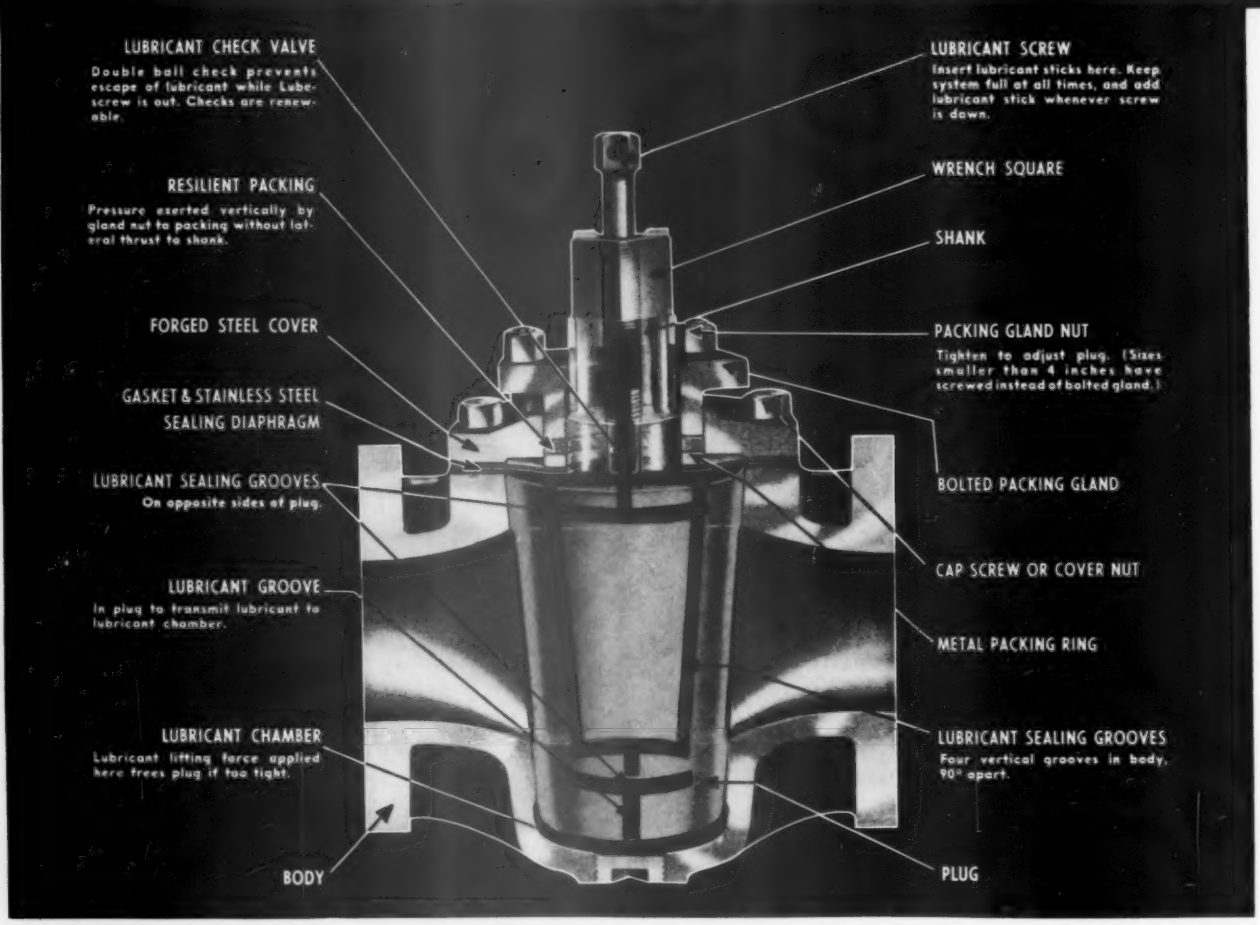
SERVICE

CONSOLIDATED EDISON



"Ain't no ordnery plug cock what'll hold that likker, Luke.

Reckon we gotta git a Nordstrom Plug Valve."


LUBRICANT CHECK VALVE
Double ball check prevents escape of lubricant while Lube-screw is out. Checks are renewable.
RESILIENT PACKING
Pressure exerted vertically by gland nut to packing without lateral thrust to shank.
FORGED STEEL COVER
GASKET & STAINLESS STEEL SEALING DIAPHRAGM
LUBRICANT SEALING GROOVES
On opposite sides of plug.
LUBRICANT GROOVE
In plug to transmit lubricant to lubricant chamber.
LUBRICANT CHAMBER
Lubricant lifting force applied here frees plug if too tight.
BODY
LUBRICANT SCREW
Insert lubricant sticks here. Keep system full at all times, and add lubricant stick whenever screw is down.
WRENCH SQUARE
SHANK
PACKING GLAND NUT
Tighten to adjust plug. (Sizes smaller than 4 inches have screwed instead of bolted gland.)
BOLTED PACKING GLAND
CAP SCREW OR COVER NUT
METAL PACKING RING
LUBRICANT SEALING GROOVES
Four vertical grooves in body, 90° apart.
PLUG

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New Water Gas Plant at Portland, Maine, Effects Economies

By
Alfred I. Phillips

ON January 26, 1939, the coal gas plant of the Portland Gas Light Company was shut down; and since then the company has supplied straight carburetted water gas, made with heavy oil in Semet-Solvay reverse flow sets. Under the conditions existing in Portland, this change has resulted in appreciably lower costs of operation; while other improvements have effected further substantial economies. A rather unusual opportunity with respect to oil purchases and tar sales has also been used to maximum advantage.

The situation appears to have been handled with especial ability by the management, and particularly by George R. Steere, the Assistant Manager of the company, who has been in direct charge of the improvements. What has been accomplished in Portland, how it has been accomplished, and how some of the various problems have been solved are matters of interest to the manufactured gas industry.

History of the Gas Works

The Portland Gas Light Company began business in 1850 with an installation of small stop-end retort benches, about which history has preserved very little information.

In 1897, the company built ten new stop-end benches of sixes, having a carbonizing capacity of about 50 tons of coal per day.

In 1914, the stop-end benches were replaced by four benches of continuous vertical retorts, with eight retorts per bench. In 1924 two additional benches were added. This brought the capacity of the coal gas plant up to about 2,000,000 cubic feet of gas per day, a capacity sufficient to care for the average send-out, which varies from a summer minimum of about 1,400,000 cubic feet per day to a winter maximum of nearly 2,800,000 cubic feet.

For many years water gas generating equipment has also been available to handle peak loads. In 1898, the United Gas Improvement Company installed two 7′-0″ carburetted water gas sets. At some later date the generators were replaced and enlarged to 8′-0″. One or the other of these 8′ x 7′ x 7′ sets, using gas oil, was used in the past to produce whatever make was required in excess of that of the coal gas plant.

The coal gas and water gas plants each had the usual auxiliaries.

Holder capacity, as will be further discussed, was and still is very limited. The two storage holders, 1,500,000 cubic feet and 500,000 cubic feet respectively, have a combined *available* capacity of only about 650,000 cubic feet, though this condition is now in process of being rectified.

There are also two relief holders of 350,000 cubic feet and 200,000 cubic feet respectively.

During the past five years, the quantity of gas produced and the maximum day send-outs have been as follows:

	Total Sendout	Maximum Days
1934	541,740 M	2,643 M
1935	556,843 M	2,405 M
1936	583,049 M	2,471 M
1937	608,717 M	2,596 M
1938	625,384 M	2,784 M

The total number of meters supplied is about 16,300.

During the past few years it became gradually and increasingly evident that changes should be made in the manufacturing plant to meet the changes in economic conditions. The company was unable to maintain a sufficient market for its coke at a satisfactory price. The price of both coal and labor advanced. Rebuilding of the coal gas benches and a complete overhaul of coal and coke handling apparatus became more and more imminent.

New Carburetted Water Gas Plant

In February 1938 a contract was made with Semet-Solvay Engineering Corporation for the installation of one 10′ x 9′ x 9′ reverse flow carburetted water gas set for use with any oil, or fuel together with U. G. I. Automatic Control. At that time it was the intention of the management to reduce the quantity of coal gas made and supply a mixure of about half coal gas and half carburetted water gas, keeping an old set as reserve equipment. However, in August, 1938 a contract was let for a second water gas set, similar to that already under construction, it having been decided to shut down the coal gas plant entirely, to dismantle the other old water gas set and make only carburetted water gas with modern equipment.

With these new sets were installed the necessary blowers, building changes, pumps, pipe lines, tar separator, washer cooler, multiple washer and tar dehydrating equipment, in fact, everything to handle the gas up

to the inlets of the exhausters except the relief holders, together with tar and waste handling facilities.

In addition a new 415 H. P. Babcock and Wilcox Stirling type boiler was installed with full automatic control to burn heavy oil. The two old 250 H. P. boilers are held as reserve.

More recently a new generator fuel handling system has been completed and put in operation.

Change Over to Carburetted Water Gas

One coal gas bench was let down in May 1938 and a second in October. Under the conditions then existing, this cut the coal gas make to about 1,000,000 cubic feet per day. Finally, on January 26, 1939 the rest of the coal gas plant was shut down and the entire load was taken over by the new water gas equipment.

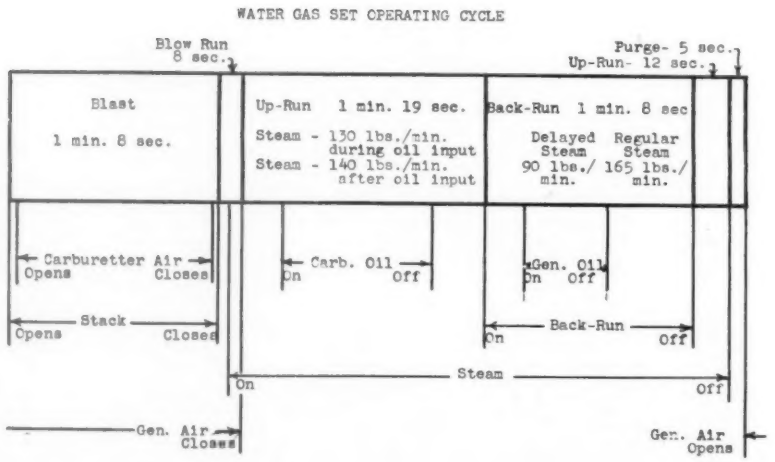
The change over from about 85% coal gas to straight carburetted water gas was accomplished with remarkably little difficulty from appliance adjustments. Prior to the change over the specific gravity of the mixed gas had been gradually raised to about .58 by increasing the blow run and purge on the water gas sets. After the change over the blow run and purge were reduced to a minimum, the gravity in this way being held to about .60. This was gradually increased to about .63, which is the normal operating figure for the plant.

Also, at the time of the change over the heating value of the gas was increased from 535 B.t.u. to about 550 B.t.u. for a short time, and distribution pressures were increased about 1". The pressure was reduced by ½" in about two weeks and brought back to normal at the end of about a month.

In spite of the fact that certain operating difficulties developed on the day of the change over, which was one of the coldest of the winter, and made it impossible to hold the heating value and gravity as planned on the first day, there were only 147 complaints out of a total of 16,300 meters, or less than 1%. These tapered off during the next ten days to almost a normal figure, the total for that period having been 554.

During this period, a survey was made of oven heat control ranges that had been installed recently, and, while in each home, the service men checked up on all other appliances. Incidentally, a great many good prospects were listed for additional equipment. This follow-up was also made with all house heating jobs.

Service men's reports show that most of the difficulty was with ranges; with high input water heaters and refrigerators next, with some few on low input water heaters and very little trouble with house heating units or industrial burners.


WATER GAS SET OPERATING CYCLE
Blow Run 8 sec.
Purge- 5 sec.
Up-Run- 12 sec.
Blast
1 min. 8 sec.
Up-Run 1 min. 19 sec.
Steam - 130 lbs./min. during oil input
Steam - 140 lbs./min. after oil input
Back-Run 1 min. 8 sec
Delayed Steam 90 lbs./ min.
Regular Steam 165 lbs./ min.
Carburetter Air Opens Closes
Carb. Oil On Off
Gen. Oil On Off
Stack Opens Closes
Back-Run On Off
Steam On Off
Gen. Air Closes
Gen. Air Opens

Operation of Water Gas Sets

The present generating equipment, as already indicated, consists of two 10′ x 9′ x 9′ Semet-Solvay reverse flow water gas sets equipped with U. G. I. Automatic Control. The generators are lined to 7′-10" and the carburetters and superheaters to 7′-2".

"New England Coke" from the ovens at Everett, Mass. is used as generator fuel, and a fire only about 4 feet deep is carried.

Heavy oil is used for both enriching and reforming. A recent analysis of the oil is as follows:

Specific gravity	10.6° A.P.I. = .996
Sulphur	.57%
Conradson carbon	12.22%
Viscosity (Furol @ 122° F.	70 seconds
Pour point	20° F.
Flash point	194° F.
Gas per gallon	46.1 cu. ft.
B.t.u. per gallon as gas (Laboratory test)	83,700 B.t.u.
Total heating value	17,980 B.t.u. per lb.

All of the enriching oil is introduced into the carburetter during the up-run. Reforming oil, constituting over 30% of that used, is introduced onto the generator fire during the back-run period. While intended primarily to act as generator fuel, the reforming oil appears to have an enriching value about one-fourth as great as that injected into the carburetter.

About 5% of the Conradson carbon content of the oil appears as a carbon deposit in the carburetter. After about 37 hours of set operation the accumulation becomes sufficient to require that it be barred down and removed.

It has been found necessary to hold the superheater heats within a very narrow range in order to avoid production of heavy pitch on the one hand and sacrifice of oil efficiency on the other. The so-called "trowel test"[2] has been of great value in helping the operators to maintain proper temperatures. The problem has been to keep superheater temperatures down, especially when carbon has built up in the carburetter, as the tendency has been for the checkerbrick to come up to gas making temperature before the generator fire, even though all of the enriching oil is injected into the carburetter. Because of this temperature balance it has been easily possible to reduce the blasting time to about 25% of the cycle; and for similar reasons the depth of the generator fire is kept at only about 4 feet.

Recently the operating cycle was on the following table.

A recent analysis of the gas shows:

CO_2	5.3%
Illuminants	7.3
O_2	0.6
CO	21.9
CH_4	14.6
H_2	37.5
N_2	12.8
	100.0%

From February to July the principal operating results have been as as on the above diagram.

Effort has been made to secure a reliable barometer of operating economy from day to day. Water gas operation has become complex, and it is now no longer sufficient to watch pounds of fuel and gallons of oil per

[2] *The "trowel test" consists in allowing a stream of gas from the outlet of the superheater, generally from a cock installed for the purpose, to impinge on the surface of a bright mason's trowel. The appearance of unfixed oil or excessive lamp black is an indication of whether or not proper temperatures are being carried.*

Water Gas Operating Results — Portland Gas Light Company

	February	*March*	*April*	*May*	*June*	*July*
Total Gas Made—M.	63,364 M	66,286 M	57,042 M	55,807 M	52,370 M	50,700 M
Average Hours Run Per Day[a]	15:36	15:29	14:04	13:56	13:55	11:59
Average Make Per Hour—Cu. Ft.[a]	147,275	140,186	135,640	133,018	129,719	141,127
Generator Fuel Per M—lbs.	16.62	15.63	14.29	13.30	13.84	13.90
Oil Per M—Gallons	4.80	4.89	4.99	4.85	4.82	4.83
Per Cent of Oil Reformed	27.4%	30.6 %	33.3 %	32.5 %	30.7 %	33.1 %
Total Oil Per M Furnishing Enrichment—Gallons[b]	3.81	3.77	3.74	3.67	3.70	3.62
Tar Made—Estimated Per Cent of Enrichment Oil	30%	30 %	32 %	32 %	32 %	32 %
Tar Made Per M—Gallons (Calculated)	1.144	1.130	1.198	1.172	1.187	1.161
Heating Value of Gas—B.t.u.	544	541	538	534	534	535
Heat Recovery Factor—Per Cent[c]	77.7%	76.9 %	78.1 %	80.2 %	80.3 %	80.1 %
F.O.T.[d]	13.7c	13.6c	13.0c	12.3c	13.0c	13.5c

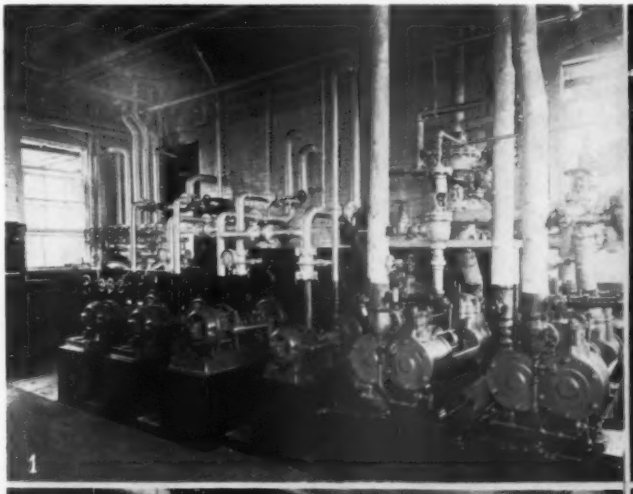
[a] This is net running time and does not include time out for cleaning, which amounts to about 2 hours in each 24 of operation.

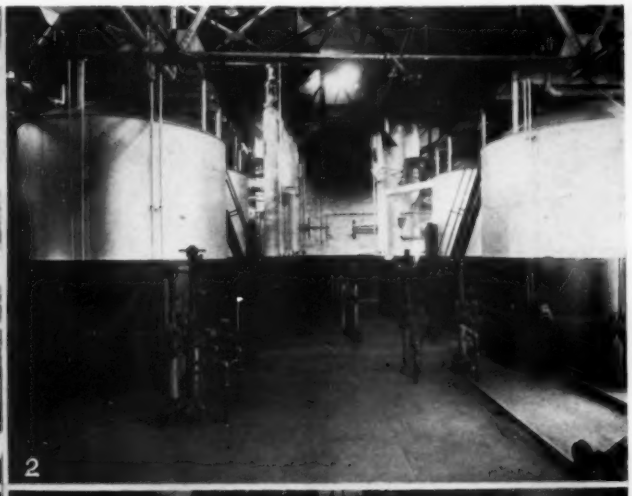
[b] Enrichment oil is taken to be the oil introduced into the carburetter plus 25% of the reforming oil which is introduced into the generator.

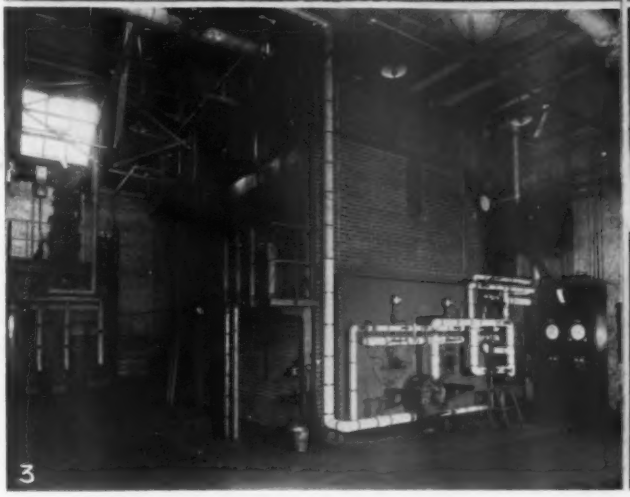
[c] Heat Recovery Factor is taken to be B.t.u. of Gas plus B.t.u. of Tar divided by B.t.u. of Generator Fuel plus B.t.u. of Oil.

[d] F.O.T. is Generator Fuel Cost plus Oil Cost minus Value of Tar Produced. Prices are:

Generator Fuel per ton	$8.50	Tar per Gallon	4.64c
Oil per Gallon to June 12	2.5 c	Oil per Gallon after June 12	2.7 c



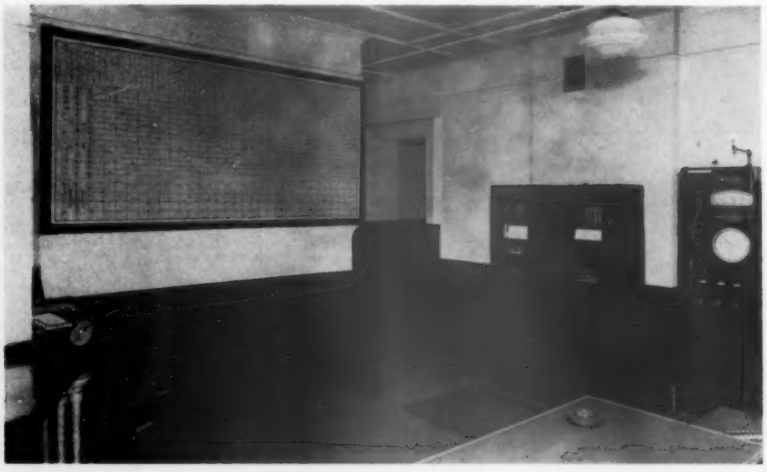




(1) Pump Room; on the right are two 9 x 5 x 10 type V D horizontal duplex steam driven Worthington pumps handling 85 GPM Bunker C Oil at 130°F. against 250 pounds discharge pressure. On the left are the pumps for hydraulic pressure system, for the cooling coils and for washer cooler. (2) Operating Floor View of Semet-Solvay Water Gas Sets. (3) 1415 H. P. Babcock and Wilcox Stirling type boiler with automatic controls for burning heavy oil. (4) Cleaning floor view of Semet-Solvay Water Gas Sets.

M. The most economic percentage of reforming and blow-run under existing material prices and with varying qualities of fuel and set conditions are important to know. The barometer used is known as F.O.T., i. e. Cost of Solid Fuel per M plus Cost of Oil per M minus Value of Tar Produced per M.

Each day the F.O.T. for the previous day is posted in chart form in the plant office; and no baseball or football scores could arouse more interest among plant employees than these daily figures giving an indication of the results of their own efforts.



Works office showing recording calorimeters and efficiency chart.

Steam is not included in the daily cost barometer since it is a relatively constant and not a very large figure. At present about 140 lbs. per M are being used; and this includes steam used for tar dehydration and for transmission pumping of about 25% of the gas at 15 lbs. pressure.

Boiler fuel is the same grade heavy oil used in the water gas sets.

A recently installed generator fuel handling system has cut costs from about 85 cents to slightly over 3c per ton. It consists of a track hopper with automatic gate and an automatic dumping car which is hauled up an inclined track. The car can be arranged to discharge into an overhead bin or into a truck for storage. The installation was made by the Beaumont Company.

Oil and Tar Storage and Handling

The situation with respect to oil storage and tar sales is unique. Tar is normally shipped from the plant a little over 24 hours after receipt of the oil from which it was made. The Standard Oil Company has set aside a large tank at its nearby station for the service of the Portland Gas Light Company. The total oil storage at the gas works consists of two 50,000 gallon tanks to handle an average daily use of about 12,500 gallons, and one of these tanks holds a reserve supply of gas oil for emergency only.

The contents of the heavy oil tank is heated by steam coils, and is never allowed to get below 100°F. The oil is further heated to 300°F. before use in the water gas set.

Tar is delivered by pipe line to the Koppers Company as soon as a sufficient amount is on hand, the entire storage for dehydrated tar being 10,000 gallons.

Another interesting fact about this plant is that it has thus far had no waste disposal problem because there is no waste to dispose of. In other words, the excess steam of water gas manufacture plus rain water in the separator and relief holder tanks is apparently slightly less than normal evaporation plus the water vaporized and driven off into the atmosphere in the tar dehydrating equipment.

Included in the list of equipment recently installed was a duplex tar separator. The drains from the wash box seal pots go to one side and those from the washer cooler, plant seal pots, etc., go to the other. The water from both sides goes to a common well from which it is recirculated. Both sides of the separator are provided with steam coils.

Thus all tar made goes to the separator except that which drops out in the relief holders, and the tanks of those are pumped as opportunity affords to work up the tar settling out.

Tar in the separator coming from the water gas set wash boxes contains 20% to 25% water, that from the washer cooler and other apparatus 10% to 12%.

From the separator the tar is pumped through a well insulated and steam heated line to a 10,000 gallon glass wool insulated horizontal settling tank—an old tank car tank. Here the tar is kept at 200°F. and water which separates by gravity is drained off. The tar then goes to the Semet-Solvay de-emulsifier, now used as a still to increase its capacity. The finished tar contains not over ½% of water.

The final tar storage consists of a glass wool insulated 10,000 gallon tank, from which it is pumped to the Koppers Company plant as mentioned above.

It has been found absolutely essential that the temperature of the tar should not be allowed to fall below 150°F. at any time.

Since this system was put into operation last Fall it has de-hydrated to .5% about 800,000 gal. of very wet emulsion that had accumulated in the plant through the years, in addition to handling an average of 2,600 gal. of heavy oil tar per day as it was produced.

Holder Capacity and Holder Heating System

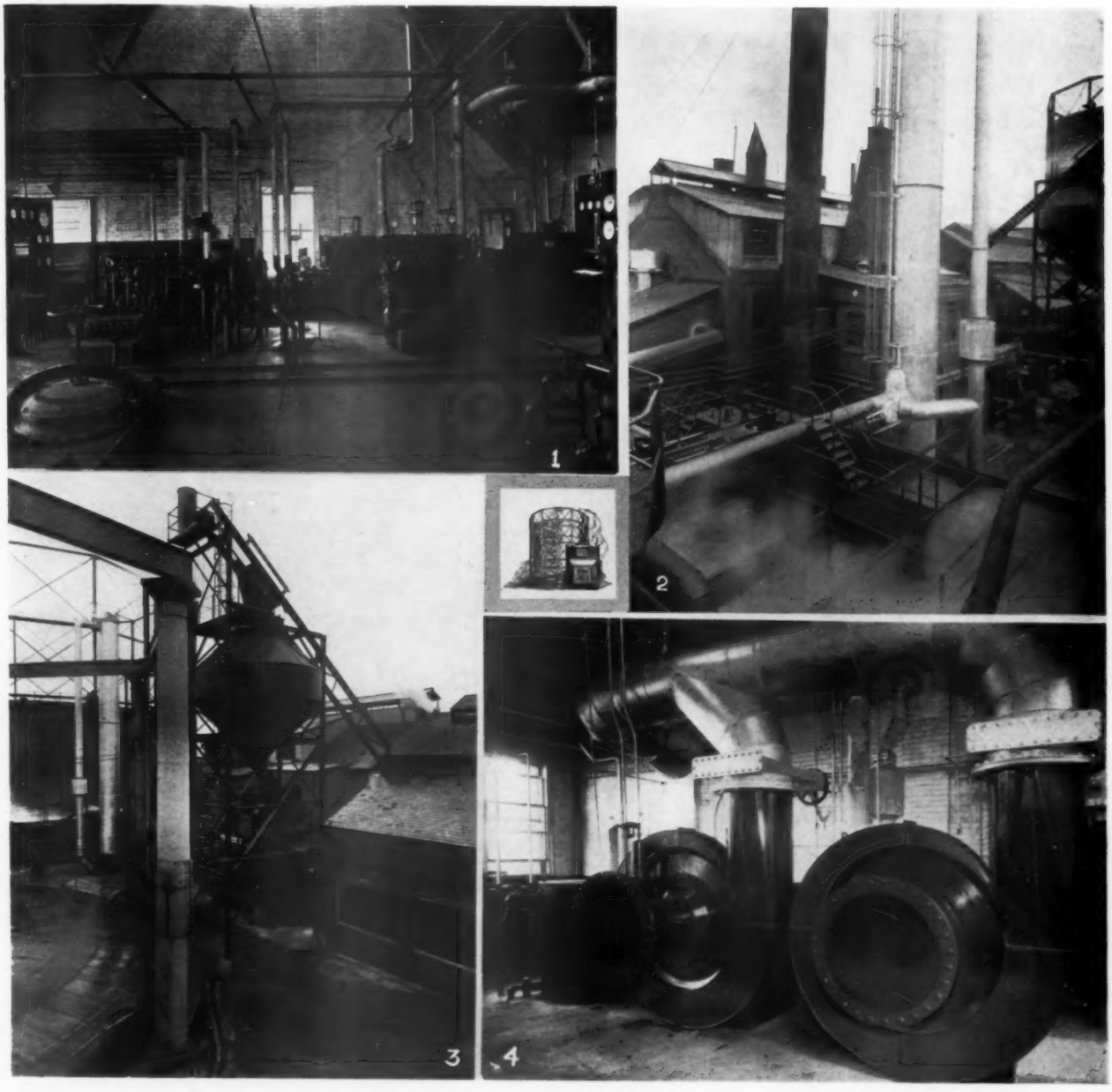
Another matter of interest is the holder situation and the holder heating system.

There are two relief holders of 350,000 cu. ft. and 200,000 cu. ft. respectively. Gas is made into the heavier of these two, which then discharges into the other through difference in pressure, the flow, of course, being properly regulated. Storage capacity for purified gas, as already mentioned, has been only about 25% of a peak day send-out; so that this unpurified gas storage has been quite essential.

Due to certain mechanical difficulties, not yet corrected, the 500,000 cubic foot storage holder for purified gas at the plant is not uncupped; and only the gas in the top lift is available. This holder throws 11½" pressure and feeds a 1,500,000 cubic foot outlying holder between 1½ and 2 miles distant by difference in pressures, the pressure thrown by the latter on its upper lift being 9.7".

In order to give sufficient pressure to feed northern Portland and Westbrook it has been necessary to keep this holder on the upper lift also, thus limiting greatly the available gas storage capacity.

A new booster installation which will make the entire capacity of this holder available consists of a Sturtevant Booster driven by a variable speed motor. The control consists of an Ellison type mercury filled glass



(1) U. G. I. Automatic and other control equipment for water gas sets. (2) Semet-Solvay Washer Cooler and Duplex Tar Separator. (3) Beaumont Water Gas Generator fuel handling system. (4) Ingersoll-Rand centrifugal blowers for water gas sets equipped with inlet air gates, which are almost closed during the run period.

pressure gauge. (A U-gauge with one leg sloping.) The sloping leg is used as the pressure side, and two electric contacts are fused through the glass at points corresponding to pressures on the two lower lifts. The vertical leg contains a permanent electric contact with the mercury. On the upper lift the mercury in the sloping leg is depressed beyond both of the electric contacts in that leg. The circuit is broken and the motor does not operate. On the lower lifts, the mercury closes the circuit through one or both of the contacts and the speed of the motor is automatically adjusted to maintain the outlet pressure at that of the upper lift, i. e. 9.7″. Suitable alarms have been installed and arrangements made to feed from the plant temporarily in case of power failure.

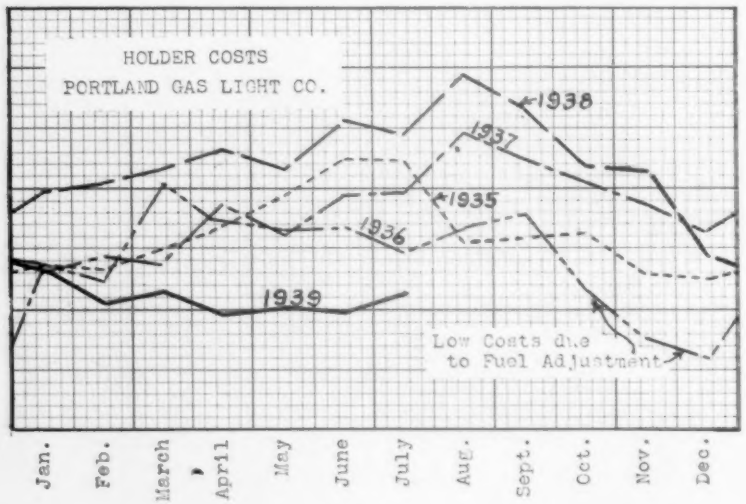
It is believed that, under the existing conditions, this installation will prove considerably more economical and satisfactory than one in which a booster is operated against a governor installed at the same site.

Both storage holders are to be heated by warm water circulation rather than by steam.

At the plant, the effluent from the washer cooler, circulating through heat exchangers, furnishes most of the heat required. However, if and when more heat is required it is provided by exhaust steam passed through a second heat exchanger.

The heating system for the 1,500,000 outlying holder is new. It consists of (1) two 20-S-63 Bryant gas fired steam boilers with automatic steam pressure and low water controls, etc.; (2) a heat exchanger in which steam passes around the tubes and water through them; (3) two Ingersoll Rand rotary type pumps capable of delivering 100 gallons per

minute against a 190 foot head, one of these being driven by an electric motor and the other by a Waukesha gas engine, and (4) the necessary piping jet nozzles, etc. There are 3 jets in each cup made of ⅛" brass pipe and provided with check valves and 8 in the tank, half being 6" from the top and the rest 18" from the bottom.



Other similar installations are in successful operation in New England; and it has been found that water circulation alone, without heating, is generally sufficient until the air temperature gets below 20°F.

School for Works Employees

When Mr. George R. Steere assumed his duties as Assistant Manager on September 1, 1938, he was confronted with a problem of human relations at least as difficult to solve as that of bringing down the cost of operation, and unextricably linked with it. Portland Gas Light Company had made coal gas since the beginning of its history. Many of the men had been with the company for years, some of them all of their lives. Each retort was an old friend which they were soon to lose; and their years of experience would soon be of no more use, if indeed they held their jobs.

During the second week in September Mr. Steere posted a notice in the plant that there would be an evening meeting at which he would discuss and describe the operation of the new water gas plant, then under construction. Any employee who wanted to come would be welcome.

When the meeting started 3 employees were present, but soon afterward they began to drift in until about 60 of the 90 plant men were there. The men were enthusiastic in desiring that the school be continued. In fact, in self defense Mr. Steere had to limit them to one night per week. The number regularly attending of course diminished; but about 20 came each week throughout a six months' period.

The theory and practical operation of coal gas, water gas, steam boilers, engines, pumps and other gas works apparatus were thoroughly discussed. Raw materials of manufacture and by-products were also covered. The object was to give the men a general understanding of the gas business, and a special understanding of the new equipment being added.

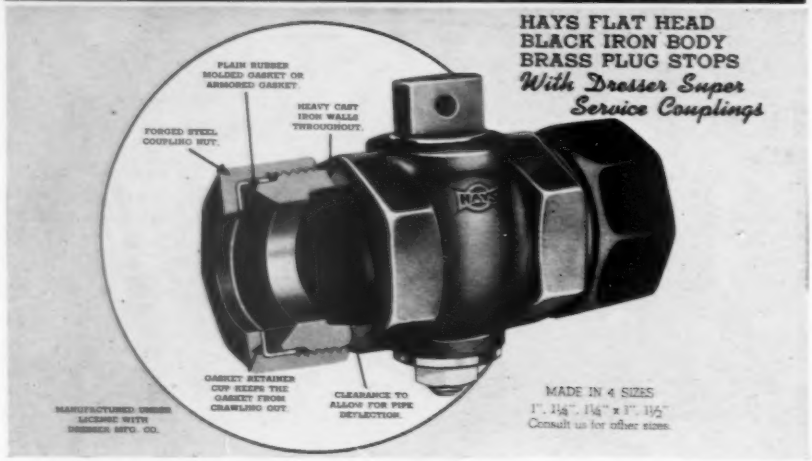
This school did much to smooth out the change-over to straight carburetted water gas without any doubt. But it has done much more. The morale and efficiency of the whole force has greatly improved, and there is an intelligent interest in the work being done and in the operating results.

Another consequence was that the office force and service employees asked to have a talk by Mr. Steere, and he has more recently been in demand to talk about the gas business before various clubs and civic organizations.

Manufacturing Costs

The result of the various changes, improvements and organization efforts has been a gratifying decline in holder costs, as shown on the accompanying chart. Since much work to improve economies is still in progress, but necessarily charged to maintenance, there would seem to be prospect of still better figures.

HAYS *Threadless* GAS STOPS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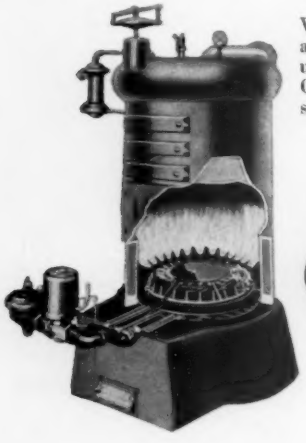
A gas appliance is only as good as its burner. In 20 years' experimentation, Barber has developed its impinged jet principle to the highest flame temperature so far attained on atmospheric pressure—1900°. This represents almost the only advance in 25 years in basic methods of combustion, since virtually all other burners still employ the primitive "Venturia Tube" principle.

The burner is the heart of the appliance—determines its performance, its salability. Manufacturers of standard appliances to the number of 157 have adopted Barber Burners. Realization of this fact should prompt *dealers and buyers* to check up and see if *their* appliances are Barber-equipped.



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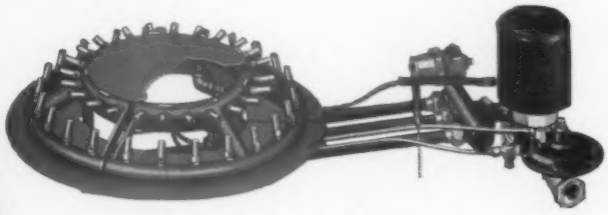
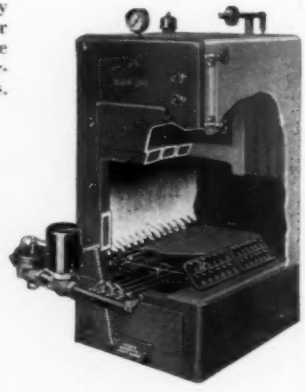


No. 324-B Barber Burner



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FOR WARM AIR FURNACES, STEAM AND HOT WATER BOILERS

Gas In a New Industry

By
Dorothy Paris

DOROTHY PARIS

THERE are two parts to this story that I have to tell you people of the gas industry, neither of which will make the story complete. Both have to do with art, the first with my art the second with yours.

To me each of the two arts are equally important. Mine gives me the excitement of being able to reproduce those fine pieces of living sculptors in such a manner that they can be multiplied a few times, enough that they may bring joy to a far greater number than could otherwise be possible. The second is in the realization that your art helps me so perfectly to develop the bodies and colors that greater joy can be had by the many owners of the pieces of art I am thus able to produce.

I shall discuss my art first, since it is the one with which I am most familiar, and which is after all the basis for the application of your art in a new industry. My art is to produce Terra Cotta editions of contemporary American sculpture. In other words the work of living American sculptors. Twelve of these most noted sculptors have lent their support to the Dorothy Paris Workshop methods. Jose de Creeft, Jean de Marco, Clara Fasano, John Flannagan, Aaron Goodelman, Chaim Gross, Minna Harkavy, Robert Laurent, Oronzio Maldarelli, Cesare Stea, Polygnotos Vagia and William Zorach, all names that represent the finest trends of American art.

These terra cotta editions of contemporary American sculpture produced by my workshop are the result of several years of research and experiment in the coloring, molding and firing of terra cotta to produce editions of sculpture that are permanent in color, weather resistant and otherwise durable. Terra Cotta is one of the most ancient and respected of all art media. There still exist today many, many examples of the art of prehistoric civilizations in terra cotta all of which are due to the three characteristics of this material noted above. After all the name of the material itself spells its greatest attribute.—*Terra* (L) earth, *Cocta* (L) cooked or baked and what else is so permanent.

Character of Products

The summary of these editions produced by my workshop result from the considerable study and research necessary to make available works of art priced according to today's purchasing power. They should not for a moment be confused with reproductions in the ordinary meaning of the term. These editions are not cast by pouring material into an ordinary two-piece mold. Some of the molds required for my editions are made up of as many as forty pieces. Each piece on coming from the mold is hand finished before firing, not to change in any way the handiwork of its creator, but to see that the green or unfired piece is exactly like the original creation of the artist.

The formulae of clay mixes as used in my workshop are my own. The colors in all cases are a part of the bodies, and there are more than one hundred fifty shades of all the colors used in the various bodies. These colors and shades are each and every one a part of the body—permanent—and in no possible way can they be chipped off. The firing of these bodies is all accomplished at high temperatures for many hours to further assure durability, quality and permanence. All of this is done for one purpose only—that each piece shall become of itself, a work of art.

The art of sculpture is as old as man. Each generation brings to the fore men and women whose work is so outstanding as to be desired and to live long after its creator. Such works are naturally seen and admired by many, but their acquisition is of course limited. This limitation is natural, first by the ability of the artist in his power to create and by the many expenses involved in the production of an original. The design, the construction of the mold, the melting and casting of metal, all require time, labor, material all limiting production and likewise acquisition.

American sculpture produced by the Dorothy Paris Workshop recently exhibited at the galleries of Raymond & Raymond, 40 East 52nd Street, New York.
"Young Girl" by William Zorach, one of twelve noted American sculptors; "Oriental Dancer" by Jose de Creeft; "Mother and Child" by Cesare Stea.

Typical Examples

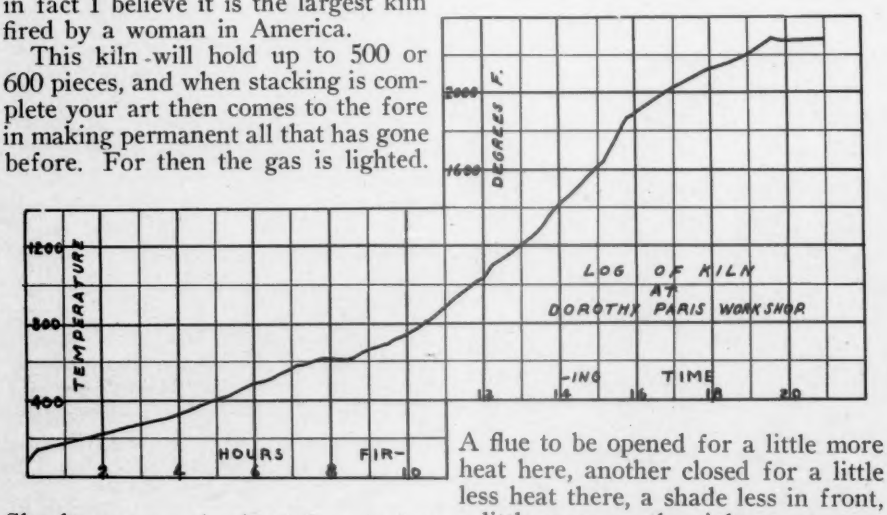
There are illustrated here several of the many pieces produced in this manner. They have every appearance of a bronze that has withstood the action of a thousand rains. Then there is the dark sun-tanned face of the Amazon whose countenance was developed in many manly endeavors and on fields of battle. There are editions as though carved from age-old granite—Purples of the sage fields of our romantic West, the green of forest and dell, the gold of ripened grain, the blue of a fathomless sky.

I could spend hours reveling in color, texture and above all in the ability of the artists who have collaborated with me in the production of many real creations of the finest of our American art. But is this not enough of reveling? Could I say more of my art? The answer is obviously yes, much more, but I shall refrain and tell you how your art is so essential to mine.

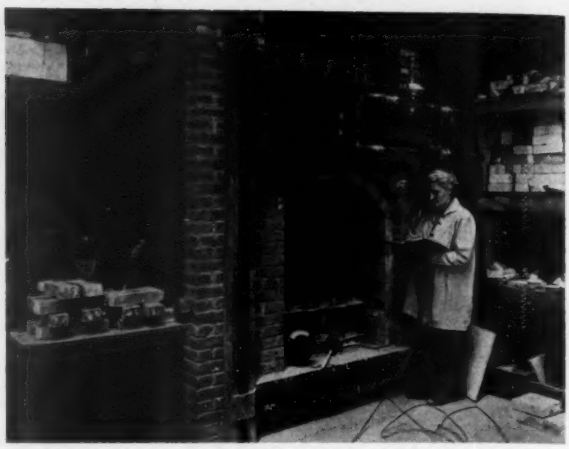
Modus Operandi

After each piece has been removed from its mold it is trimmed for moldmarks, each and every mark of the sculptor being retained without touch or retouch. Each piece is then given time to dry, requiring from one week to ten days. After drying the next step comes in stacking the kiln. My kiln as you will note is a large one, in fact I believe it is the largest kiln fired by a woman in America.

This kiln will hold up to 500 or 600 pieces, and when stacking is complete your art then comes to the fore in making permanent all that has gone before. For then the gas is lighted.



Slowly, so very slowly at first, is the gas allowed to burn, just enough to warm the kiln. Though drying for a week or more, there is still a lot of mechanical water to be removed. This is done by raising the kiln temperature to 250°F. and holding it at that temperature for a long time. Slowly it is allowed to rise, only from 25 to 40 degrees an hour until 500 degrees has been reached. We have been careful during this water-smoking period, and we know that none of the pieces have broken open.



The kiln is fired from top front and bottom rear. Proportioning controller permits control of input from air valve only. Oxidizing atmospheres automatically maintained.

Temperature Rise and Control

Now that mechanical water has been removed, we can move along a little faster, say from 75 to 100 degrees hourly. We continue so until we have reached a temperature of 1200°F. Time is here a factor, and the work is not allowed to go over 1300° until oxidation of the organic materials has taken place. Then and only then is it possible to what do you say, "give it the gun".

Burners are now at capacity, and about four hours of this are needed to completely burn the ware. Four hours of constant watching of pyrometric cones, noting that all parts of the kiln are at uniform temperature.

A flue to be opened for a little more heat here, another closed for a little less heat there, a shade less in front, a little more on the right center.

"A man's job, you say. Truly a job it is, but not necessarily a man's, for I personally fire each kiln in my workshop; but I will admit it is a real, consistent and constant job. I think in this part of the job I have a decided advantage over any man in firing for I don't think any man or woman could derive the enthusiasm for the results obtained in the realization that gas fuel and its heat can give so much beauty and permanence as is had when my kiln is opened and I view several hundred pieces of my perfect editions. The male kiln fireman is as a rule not the artist viewing his handiwork.

It is exciting to open a kiln—wherein every piece is entirely perfect—none overfired, none underfired, colors clear, none warped, none cracked, finish perfect, all objects worthy of admiration.

Gas the Controllable Fuel

Reasons? Yes, there are many which I have contributed but there are still two others and good ones, too. The kiln and the fuel. Gas with its controllable features, its cleanliness, its prompt reaction to simple handling and its ready response to every desire in firing. A chart of one of these firings is reproduced here.

As to the kiln, it too plays its part. The design is in one respect new. My kiln, as you will note, is fired from the top front and it is also fired from the bottom rear. Three flues on each side from top and bottom give every opportunity of controlling temperatures top and bottom, front, center and back on both sides. About sixty-five per cent of the heat is applied at the bottom of the kiln, under the floor and around the lower half of the muffle.

The remaining part of the heat is applied over the roof of the muffle and halfway down each side enabling complete control of top temperatures, relying in no way on left-over heat from the bottom burners. Gas and air are supplied through a proportioning controller which permits of gas input being controlled from the air valve only. Oxidizing atmospheres are always automatically maintained after first correct adjustment. The percentage of excess air is greatest during the water-smoking and oxidation periods, then still sufficient right on through the period when strength is given to the body and the colors are developed.

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(1) Gas and Electric Plant showing oil tanks and gas holder. (2) Gas and Electric Plant showing section housing gas equipment in the foreground and also purifiers now used as tar scrubbers. (3) Dayton oil gas generating unit, inside of doorway.

Dayton Oil Gas Plant Supplies Peak Island, Maine

One of the smallest and at the same time most unusual gas works in the United States supplies the summer resort community of Peak Island, near Portland, Maine, from about May 1st to the latter part of October each year.

The Casco Bay Light and Water Company operates a combination gas and electric plant. The electrical equipment consists of three Diesel engine driven generators. The gas plant contains a Dayton Oil Gas Machine with the necessary accessories.

The Dayton Oil Gas Machine consists of a closed furnace in which there are two cast steel retorts about 24" in diameter by 4" wide internally. They are shaped much like a large watch case.

Gas oil is atomized, mixed with air and injected into the retort, where a partial combustion of the oil takes place and sufficient heat is liberated to gasify the rest. The oil producer gas thus generated leaves the retort and passes through a heat exchanger where the incoming air is raised to a high temperature and the outgoing gas is partially cooled. The gas then passes through a scrubber and two old purifying boxes which are filled with coke to remove such tar as is not taken out in the scrubber. Finally, the gas is measured by a wet drum station meter and goes to the storage holder, which has a capacity of about 25,000 or 30,000 cubic feet. Thence, it is distributed at high pressure throughout the Island. The entire plant is very compact, only the small wing shown in the photograph being used for the gas-making equipment.

Gas oil is used for Diesel engine fuel as well as the raw material for gas manufacture.

The Dayton plant will generate about 5,000 cubic feet of gas per hour. It is operated about every third day, at which time a make of about 20,000 cubic feet is generally required to fill the holder.

In starting up the plant, an oil burner inside the insulating jacket of the Dayton machine is used to heat the retorts externally up to gas making temperature. External heating is then discontinued and all of the heat is thereafter supplied by internal combustion.

New Pacific Coast Branch of American Gas Association Testing Laboratories Dedicated

On August 31, the new building of the Pacific Coast Branch of the American Gas Association Testing Laboratories, located at 1425 Grande Vista Avenue, Los Angeles, California, was dedicated. Over 125 utility and manufacturer representatives were present at the dedication ceremonies and to inspect the progress of this $40,000 structure. At the time, forms were being taken off the foundation walls and plans were ready to start the steel work and roof construction. It is estimated that the new Laboratories' structure will be ready for occupancy around November 1st of this year.

Acting as Master of Ceremonies, Mr. R. G. Logue, Vice-President of the Ward Heater Company, introduced the principal speaker of the day, Mr. Arthur F. Bridge, Vice-President and General Manager of the Southern Counties Gas Company, and a member of the Laboratories Managing Committee.

Other speakers on this occasion were Mr. R. G. Logue, Mr. E. H. Poe, Miss Jessie McQueen, Secretary of the Natural Gas Section and Home Service Counselor, respectively, of the American Gas Association, and Mr. Carl A. Swigart, Trade Relations Representative of the Pacific Coast Association. Mr. Swigart also read some of the numerous telegrams which were received expressing good wishes for the continued success of the Laboratories' program.

WHAT'S the best way today for a utility to protect its present gas load . . . stimulate the sale of gas appliances . . . increase load without extra investment . . . publicize the modernity of gas . . . promote the use of "Gas for All 4 Jobs"?

Executives in the gas industry are focusing their attention on the interesting way in which gas refrigeration gives them a pass-key to these five doors of opportunity.

The accomplishment of each of these will not only bring any utility immediate profit . . . but each in itself represents an opportunity to build for the future.

For in selling gas refrigeration to a family now only cooking by gas, the home is less likely to turn to any other fuel; thus load is protected . . . the refrigerator adds new load . . . the woman in the kitchen thinks of gas as the modern fuel . . . wants other appliances.

Beyond these facts is the important point that this year alone, it is estimated, more than a million families will replace their present worn-out automatic refrigerators.

Once lost, this opportunity for replacement sales may not recur again for years; but by pushing gas refrigeration today, you'll not only win many new customers, but get old ones to add new gas services.

Gas Refrigeration:

- **PROTECTS YOUR PRESENT GAS LOAD**
- **INCREASES LOAD WITHOUT EXTRA INVESTMENT**
- **STIMULATES THE SALE OF OTHER GAS APPLIANCES**
- **PUBLICIZES THE MODERNITY OF GAS SERVICE**
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Chief Engineer
Pittsburgh Equitable Meter Company

IT IS very unfortunate for the gas distribution engineer that the Destiny responsible for the law of gas flow through pipes placed the the factor h (by which we usually denote pressure loss along a given length of pipe) on one side of the equation, and the velocity factor s, raised to the second power, on the opposite side. Many of the headaches and worries incidental to gas distribution work could be eliminated if we could only work under a system whereby the pressure loss was independent of velocity, or at least, to make a compromise—varied only as the first power of the velocity. As it is, if we double the velocity of flow through any given pipe, we increase the pressure loss along this section by approximately four. The result in a distribution system is a serious decrease in pressure as we follow the gas flow stream from its point of introduction into the system up to the farthest point of gas flow. As the consumption increases with the coming of a peak hour, this pressure loss increases very materially, and as a result the gas appliances, particularly at the far end of the flow stream, are called upon to work under a rather widely varying set of pressure conditions.

To express this fact mathematically, we can write the basic flow formula (on which practically all pipe flow equations are based);

$$h = P_1 - P_2 = \frac{4fP\,s^2l}{D}$$

where

- h = Pressure loss from the point of introducing the gas into the system to the farthest point of the flow stream.
- P_1 = Initial pressure.
- P_2 = Terminal or final pressure.
- f = Friction factor (dependent on various factors)
- P = Gas density.
- s = Velocity.
- l = Length of line.
- D = Diameter of pipe.

A quick examination of this formula reveals that the pressure loss varies directly as the square of the rate of flow; directly as the first power of the gas density; directly as the first power of the line length, and inversely as the first power of the pipe diameter. While the factor f varies a little with D, s, and P, this variation is small enough to be neglected in our consideration.

It is obvious if we increase D — the pipe diameter, we decrease h — the pressure loss. In other words, we know a larger pipe size or more pipes will help a lot. The pipe size increase helps in two ways; first, in actually providing less pressure loss, and second, for a given rate of flow expressed in cubic feet per hour, which is our normal unit for expressing rate of flow, the larger the pipe diameter the less the actual linear velocity along the pipe. In the most workable form of the flow formula D is expressed to the fifth power.*

It is also obvious if we increase the length of pipe through which we study the pressure loss the pressure loss will increase. Thus if we try to serve consumers further away from our point of introducing gas, our pressure loss to these far consumers will be greater. It is further obvious that if each consumer along the line increases his individual consumption, this added total consumption will increase our velocity factor very rapidly, and hence our pressure loss. We have many factors in a simple pipe system such as a normal low pressure gas distribution system, which continually interferes with the distribution engineer's efforts to provide a satisfactory and constant pressure for each consumer.

The mathematical factors mentioned above apply no matter what method is used to introduce gas into the system. Perhaps the simplest method is an ordinary single holder. Here the pressure depends on only one factor, the weight of the holder lifts (providing a section does not uncup), and is applied at but a single point in the system. We might use a single pressure regulator fed from a high pressure line, and obtain the same result within the ability of the regulator to maintain a constant pressure at its immediate outlet. For a system covering a large area, the distance to the far consumer is so great that a single holder will not suffice, for the factor l in our formula will be so great that h, the pressure loss will increase rapidly and an unsatisfactorily low pressure will exist at the far consumers' appliances during hours of high consumption by all consumers. This we can help by putting another holder in the system so located as to serve the consumers too far distant from the first holder. This is fairly common practise which helps in two ways; first, by reducing l, the distance to the farthest consumption point, and by cutting down the quantity carried by the heaviest loaded section of the distribution main under the single holder system.

If we install regulators instead of holders, we do not materially change the principle except that many more regulators can be installed since their cost is small compared to holders, even considering the cost of the high pressure feeder mains for a system of this type.

Our typical system then is one in which a fairly large number of

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* *In a practical workable form, the flow formula becomes*

$$P_1 - P_2 = .000003359\,\frac{f\,w\,Q^2\,l}{d^5}$$

where

- P_1 = *Initial pressure in pounds per square inch.*
- P_2 = *Final pressure in pounds per square inch.*
- w = *Specific weight in pounds per cubic foot.*
- Q = *Rate of flow in cubic feet per hour.*
- l = *Length of line in feet.*
- d = *Diameter of line in inches.*

For derivation of this formula, see American Gas Journal, May and June, 1938—"The Flow of Fluid Through Pipes."

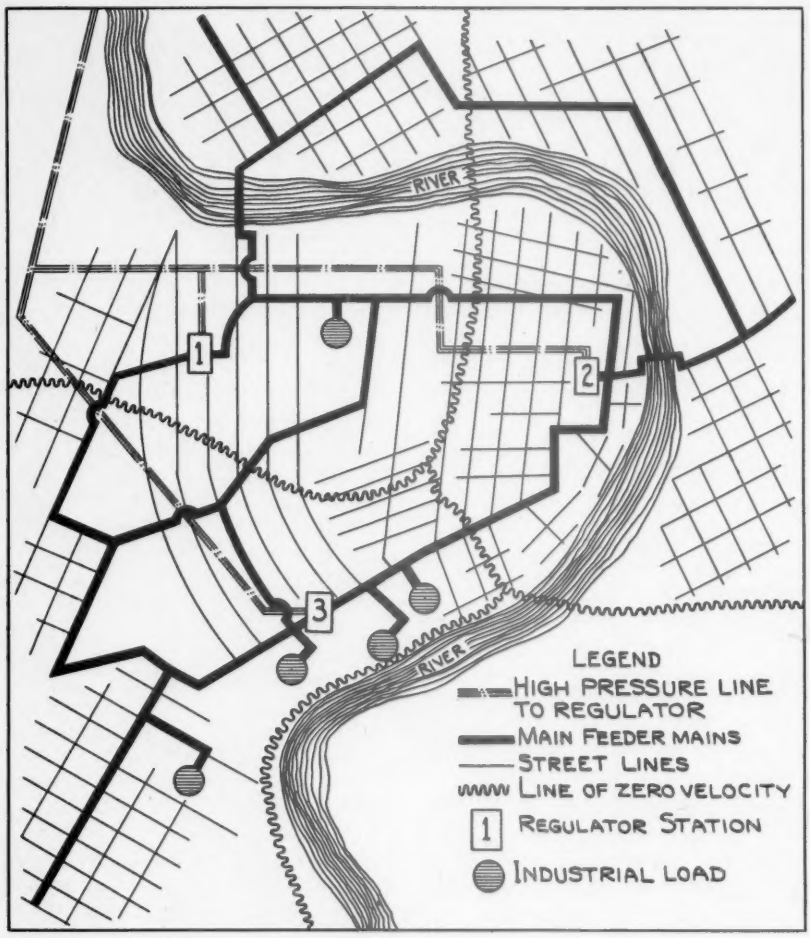


Fig. I Typical Distribution Network, Fed by Three Regulators.

points, fed through regulators from a high pressure line, are used to introduce gas into a low pressure system. It would be possible to allot a given area of low pressure piping to each regulator, and by using valves in the main network confine the gas from each regulator to this area. However, safety considerations, and the possibility of a regulator failing, makes it advisable to leave all outlet mains interconnected freely with the others, without any attempt to limit a certain area to a given source of supply. For instance, if a regulator should fail to open, or for some reason is too small for the area normally expected to be covered by it, other regulators will tend to feed part of its territory and there will be no pressure outages, (though there will no doubt be some rather low pressure spots). On the other hand, let us suppose a regulator fails to shut off completely at low load hours, it will tend to build up the pressure at the outlet. A "valved-off", or locally isolated system would experience a rather fast pressure increase; an interconnected system would carry away this pressure increase and prevent a local build-up which would be dangerous, tending to spread a smaller build-up over the entire system.

From this fact, that several regulators may feed a common system, arises many pressure troubles occurring in distribution work, particularly where we find it advantageous to use some of the devices to automatically increase pressure at the immediate outlet of the regulator as the rate of flow increases. This type of pressure control will be discussed at length later. For the present let us make a study of the pressure in an interconnected distribution system under a given set of load conditions, when fed from several sources.

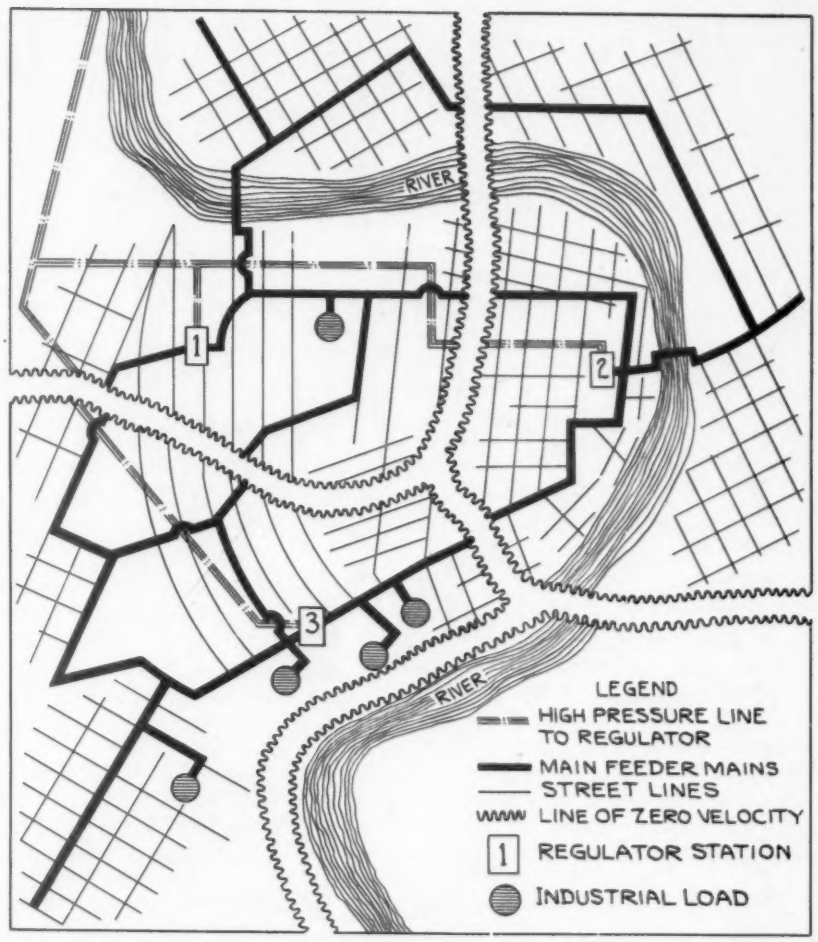
In Fig. I we see the distribution network of a typical system. To cut down complicity we show but three regulators feeding the system. The principles we are about to discuss will be the same no matter how many regulators are applied.

If we have a low load hour, such as we would have at night in warm weather, the actual gas consumption would be small and because pressure loss under such small loads would be extremely small, we would have only a small pressure variation over the low pressure system. Let us assume that we could set the outlet of each of the three regulators 1, 2 and 3 to the same value at this low flow. This outlet pressure we will call P_1, P_2 and P_3.

There is, of course, some gas being used by pilot lights, refrigerators, etc. by domestic consumers and some few commercial consumers such as restaurants, etc. If we were to follow the gas flow from regulator No. 1 along one of the main distribution mains we would eventually come to a point where this gas would meet the gas from another regulator station, say station No. 2. At this point of meeting the actual gas velocity is zero, and the pressure of the gas from one regulator will exactly equal the pressure of the gas from the other regulator. The pressure at this point during low load hours will be slightly less than at the regulator's immediate outlet. Following this same procedure along any other main which can eventually connect to another regulator we come against a point where the velocity is zero, i.e. the gas from regulator station No. 1 meets the gas from another regulating station. By following all of the possible lines or combination of lines between regulators, we can determine all points of zero velocity. If we connect these points, as shown by the wavy line in Figure I, we have around each regulator the area served by it under the existing load conditions. We might call this area thus made by connecting the points of zero velocity the "zone of influence" of this regulator. The actual pressure at the points which lie along the zero velocity line will vary a little. However, for any one set of conditions this variation is small, so we can call the pressure at these points p. In Fig. II the three zones of influence demarked by a slight separation, that is, that section of the map fed by one regulator, is bodily moved away from the other to clearly outline its area.

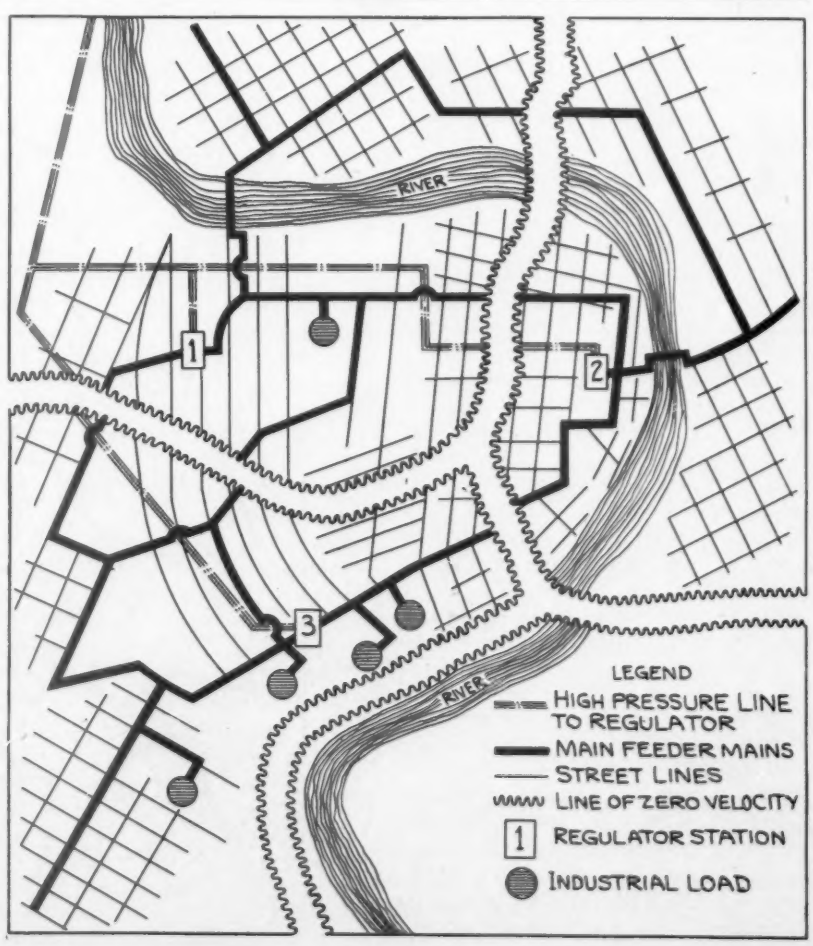
By looking at the density of lines on our map near regulator station No. 2, we would deduce that the area bounded by the crook in the river near this station is the most densely concentrated load area. If very much gas heating is done in this "down town" part of the system, we can well imagine that the morning hours (say from six AM on) during cold weather would find a fairly large load increase. Then if we were to make a pressure survey at seven AM when our delivery through station No. 2 has increased rapidly, we would find the same outlet pressure value P_2, at the regulator's immediate outlet. However, because of the added load each main must carry, a more rapid decrease in pressure as

Fig. II Zones of influence separated to distinguish them.



we go away from the station would take place. If during this period of increasing load, the load fed by regulator No. 1 was not increased as rapidly, there would not be as rapid a falling off of pressure as went away from the regulator station along a main. It is obvious, then, the point of zero velocity, where the pressure of the gas from regulator station No. 1 must equal the pressure of the gas from regulator station No. 2, will move along the main toward station No. 2. The zone of influence of regulator No. 1 has extended toward regulator No. 2. Obviously the pressure at the line of zero velocity will be considerably below P_1 and P_2, the regulator's immediate outlet pressure, and we will call the new low pressure p′. Since the distance of the gas flowing from regulator No. 1 to the line of zero velocity is increased, and the actual rate of flow is increased because of the new consumers added to regulator No. 1 load when the line of zero velocity moved, the pressure p′ will be less than the pressure p. In other words, the consumer will be served with gas at a pressure considerably lower than the pressure P_1 and P_2 which exists at the regulator's

Fig. III Zones of influence with load concentrated near Regulator Station No. 2.



immediate outlet. We will assume for the time being that P_1, P_2, and P_3 stay the same during load changes, i.e. that the regulator does well the job of holding its outlet pressure constant.

At station No. 3 the load increase has not been as fast as at station No. 2, but about the same as at station No. 1. Then our lines of zero velocity will not change much between station No. 3 and station No. 1, but will move toward station No. 2 from station No. 3. Now if we plot our zones of influence we will obtain a condition somewhat as shown in Fig. III. We have materially different zones of influence about each regulator.

It will be noted that near station No. 3 there are several industrial loads—bakeries, galvanizing plants, sugar refinery, etc., foundries. If at a later time during the day several of these loads hit at once, the demand on regulator No. 3 will increase. Its zone of influence, particularly toward station No. 2, will shrink, and our pattern of distribution will change to that shown in Fig. IV.

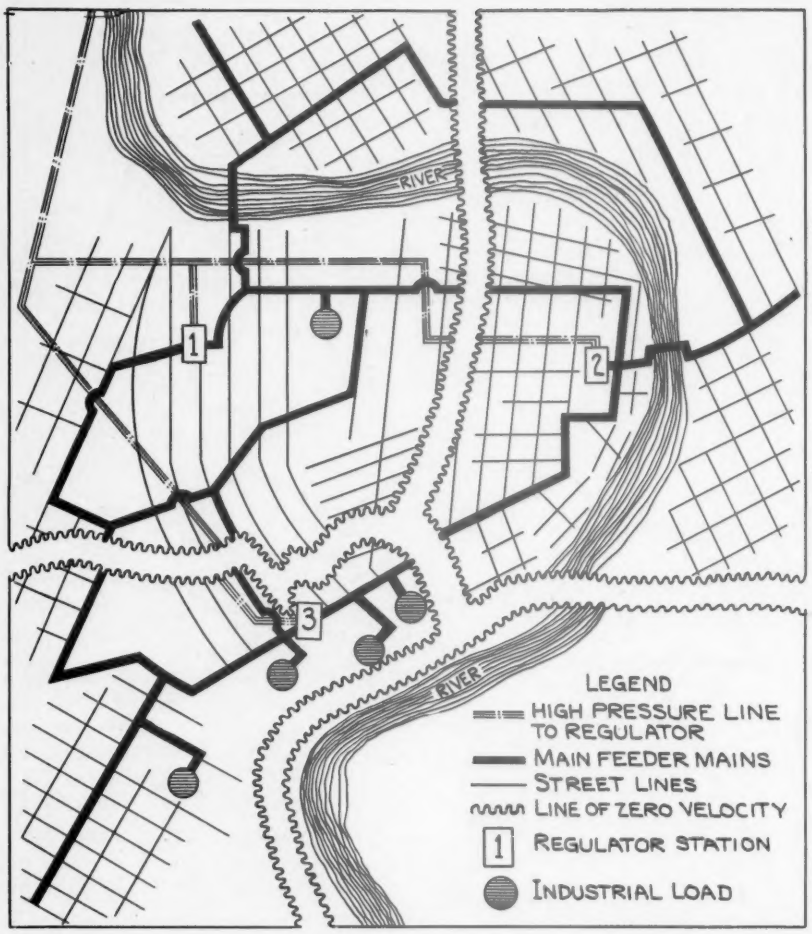


Fig. IV Zones of influence when industrial load near Regulator Station No. 3 is increased.

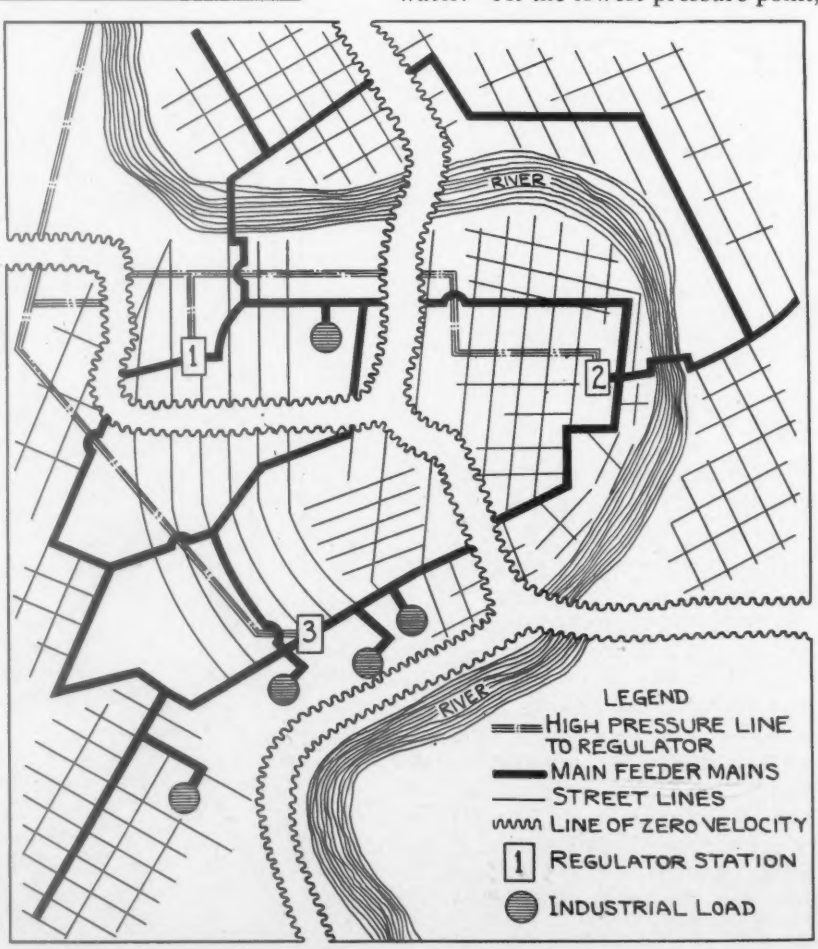
Fig. V Zones of influence with large cooking load near Regulator Station No. 1.

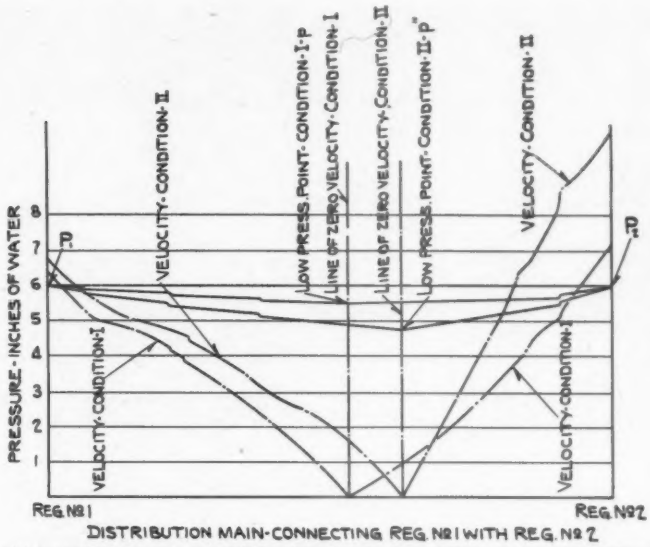
Station No. 1 may be a residential district, and we will find a peak hour somewhat heavy, let us say on Sunday morning due to cooking the Sunday midday meal. The industries may not require much gas on Sunday, and the area around station No. 2 may be more commercial than dwelling, and therefore have a rather small Sunday demand. This would mean that the line of zero velocity and the zone of influence would move from station No. 2 and No. 3 toward No. 1. A pattern such as Fig. V could result.

If we could lead our imagination one step further and imagine a load increase proportional on all three stations, we would have our lines of zero velocity remaining the same as at low load hours, and we would have our zone of influence continually the same shape. However, due to high load, with its resultant greater velocities, the actual pressure at our lines of zero velocity would decrease very rapidly. P_1, P_2, and P_3, the immediate outlet pressure at the regulator, stays the same, but the low pressure points p′ along the zero velocity lines might be dangerously low.

To illustrate further the concept of pressure and load variation influencing our zone of influence, let us trace any path in the pipe line system that would lead from one regulator to another. We can straighten this path out and represent it graphically in Fig. VI. Although the actual path would no doubt change direction and even altitude many times (which we are neglecting in this study), we can represent it by the base line in Fig. VI.

In the graph the dot and dash line represents the velocity along the main. At the left side, it leaves regulator No. 1 and as it flows to the right, since varying amounts are taken off by side mains and consumers, the velocity decreases rather rapily until it reaches zero; if we trace the velocity from regulator No. 2 we see that proceeding to the left the velocity decreases and must reach its zero value at precisely the same point where the gas from regulator No. 1 reaches zero velocity. Under the set of load conditions, which we have labeled Condition I, the pressure at the immediate outlet of regulator No. 1 and regulator No. 2 is 6″ of water. At the lowest pressure point,

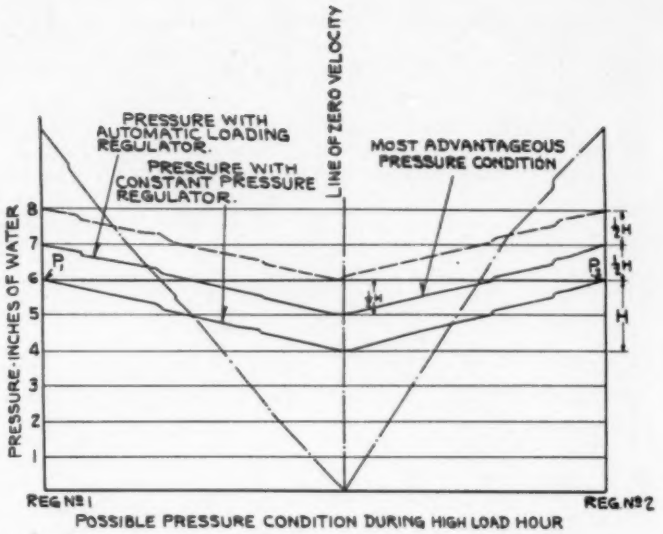



PRESSURE - INCHES OF WATER
VELOCITY - CONDITION - II
VELOCITY - CONDITION - I
LOW PRESS. POINT - CONDITION - I - P
LINE OF ZERO VELOCITY - CONDITION - I
LINE OF ZERO VELOCITY - CONDITION - II
LOW PRESS. POINT - CONDITION - II - P
REG. Nº 1
REG. Nº 2

DISTRIBUTION MAIN-CONNECTING REG. Nº 1 WITH REG. Nº 2

STUDY OF VELOCITY AND PRESSURE IN A DISTRIBUTION MAIN CONNECTING TWO PRESSURE REGULATORS UNDER TWO CONDITIONS OF LOADING

FIG. VI


PRESSURE WITH AUTOMATIC LOADING REGULATOR.
PRESSURE WITH CONSTANT PRESSURE REGULATOR.
LINE OF ZERO VELOCITY
MOST ADVANTAGEOUS PRESSURE CONDITION
PRESSURE - INCHES OF WATER
REG. Nº 1
REG. Nº 2

POSSIBLE PRESSURE CONDITION DURING HIGH LOAD HOUR

FIG. VII

which occurs at the point of zero velocity, we have approximately 5.6 inches of water.

For Condition II, we have assumed a load condition which gave us zones of influence such as we show in Fig. III, i.e., the load has increased rather rapidly at regulator No. 2 and has not increased perceptibly around regulator No. 1. The velocity curves labeled Condition II show us approximately what happens. Because of higher consumer demand, the higher initial velocity at regulator No. 2 is represented by a velocity line which has a higher initial value on the graph. As the gas moves toward the left the velocity decreases at a higher rate than under Condition I, since consumer demand increased the rate of flow. If we examine the pressure curve for Condition II, we see it starts out from regulator No. 2, and the same value as under Condition I; this, of course, because the regulator in its operation is designed to maintain a constant outlet pressure at its immediate outlet. However, as we progress along the flow stream toward the left, we see the pressure decreases rather more rapidly than under Condition I. Our rate of flow-pressure loss relation now comes in, and we must expect a pressure loss in proportion to the square of the flow rate; hence the rather more rapid drop in pressure.

Going over to regulator No. 1, where there has been no increase in consumer load, we find there is an increase in velocity, however. If we continue toward the right, we finally come to the point of zero velocity, where the gas from regulator No. 2 is met. We find that this point has now moved away from regulator No. 1 toward regulator No. 2. A study of the pressure line shows that the gas starting from regulator No. 1, having the same pressure as the starting pressure under Condition I, decreases at a slightly faster rate because of the slightly higher flow rate. However, the point at which it comes to the same value as the pressure line from regulator No. 2, must coincide with the new point of zero velocity, which, as stated above, has moved away from regulator No. 1 toward regulator No. 2. Those consumers between the two points of zero velocity are now fed, under Condition II, by regulator No. 1, instead of by regulator No. 2, as was the case under Condition I. These added consumers account for the increase of velocity from regulator No. 1 under Condition II. If we were to make a similar analysis of velocity and pressure along any of the many other possible paths from regulator No. 1 to regulator No. 2, we would find about the same condition. The point of zero velocity moving in every case away from regulator No. 1 toward regulator No. 2, and the zone of influence of regulator No. 1 extending, taking on more consumers, and the zone of influence of regulator No. 2 shrinking. This means fewer consumers fed, due to the large increase in consumption per consumer in the territory near it.

Fig. VI Distribution main connecting Regulator Station No. 1 with Regulator Station No. 2.

Fig. VII Distribution main connecting Regulator Station No. 1 with Regulator Station No. 2, with load increase proportional on the two stations.

If our load conditions are such that we get about the same percentage load increase at regulator No. 1 as at regulator No. 2 and at the same time our velocity-pressure graph would be somewhat as in Fig. VIII. This we will call Condition III. Here our point of zero velocity is at the same location, but due to our velocity-pressure loss relation, the pressure at the low pressure point is considerably lower than under Condition I. Those consumers in the vicinity of the line of zero velocity will have a rather large pressure variation due to these load changes. At low loads a pressure of 5.6 inches of water; at high load periods a pressure as low as 4 inches of water. In appliances called upon to work under widely varying pressure, such as those near the zero velocity line, combustion is not efficient, they are difficult to adjust, and will give rise to consumer complaint.

Our first reaction would be to raise the pressure at the immediate regulator outlet, so that the pressure would never go down to a value which would be dangerous. However, the variation in pressure would be the same. We can show this graphically by the long dash line in Fig. VII. One disadvantage of raising the pressure overall in this manner is that leakage, which varies probably as the first power of the pressure (the first power because it is in the sinuous flow range) mounts rapidly.

Further study of our pressure problem would probably suggest raising the pressure at regulator No. 1 and No. 2 in proportion to the load. During low load hours keeping the pressure at the immediate outlet of the regulators low, and increase it (automatically and proportionally if possible) as the load increases. If during our high load shown, the pressure loss from the regulator station

to the point of zero velocity is H, we should raise the pressure by ½ H at the regulator, and expect a decrease of ½ H at the point of zero velocity. In this way the maximum variation of any consumer's pressure would be ½ H, and the intermediate consumer would have variations less than this. Probably certain intermediate consumers would have practically no variation in pressure during the entire load cycle.

Under this condition also we have a lower *overall* pressure than if we raise P_1 and P_2 by H, this initial pressure being approximately ½ H above P_1 and P_2. This lower overall pressure is important in that it decreases the leakage of the system. In many systems this decreasing the leakage is just as important if not more important, than the maintenance of the consumer pressure as nearly even as possible.

The problem of varying the regulator outlet pressure in proportion to the load has been approached many times. Time operated devices for taking weight on and off the regulator have been used. "Around-the-block" systems are common, systems which create near the regulator a synthetic low pressure point, whose pressure roughly follows the pressure of the zero velocity points, and this point is connected to the regulator diaphragm. The regulator diaphragm will act on the valves to control this synthetic point to a constant pressure, thus increasing under high load conditions the regulator's immediate outlet pressure.

Most attempts to solve this automatic loading problem, however, make use of the dynamic effect of the gas velocity as this velocity increases with the approaching peak hour. We know that if we impose a restriction, such as an orifice or venturi, in a flowing gas stream, we obtain a local pressure loss in the gas stream, this pressure loss depending on the square of the gas velocity. Since this local pressure loss depends on the square of the gas velocity, and since pipe line pressure loss depends also on the square of the gas velocity, it is only natural to try to use this fact for automatic pressure loading. We know that in flowing through a venturi or orifice plate, the immediate pressure loss is partially restored

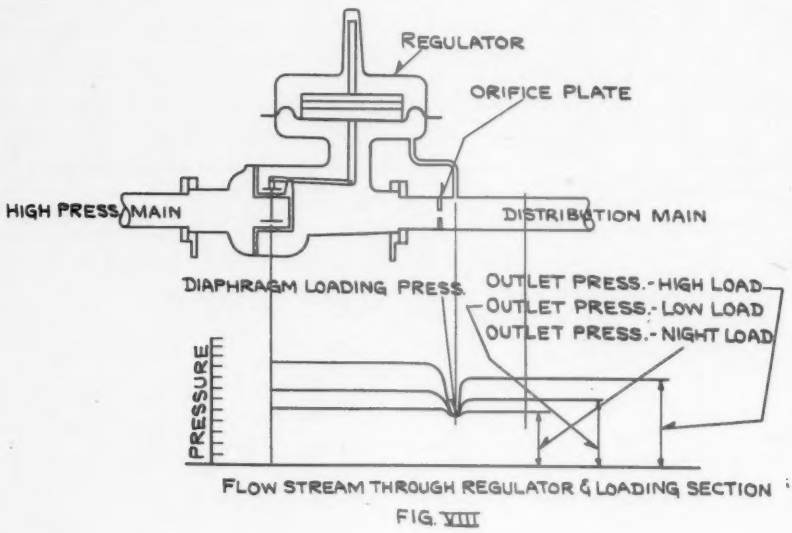


Fig. VIII Schematic view of loading device giving pressure relation used in automatic loading.

in a short distance, i.e. after this local point of low pressure we have a restoration of pressure, this restoration of pressure also depends on the square of the velocity.

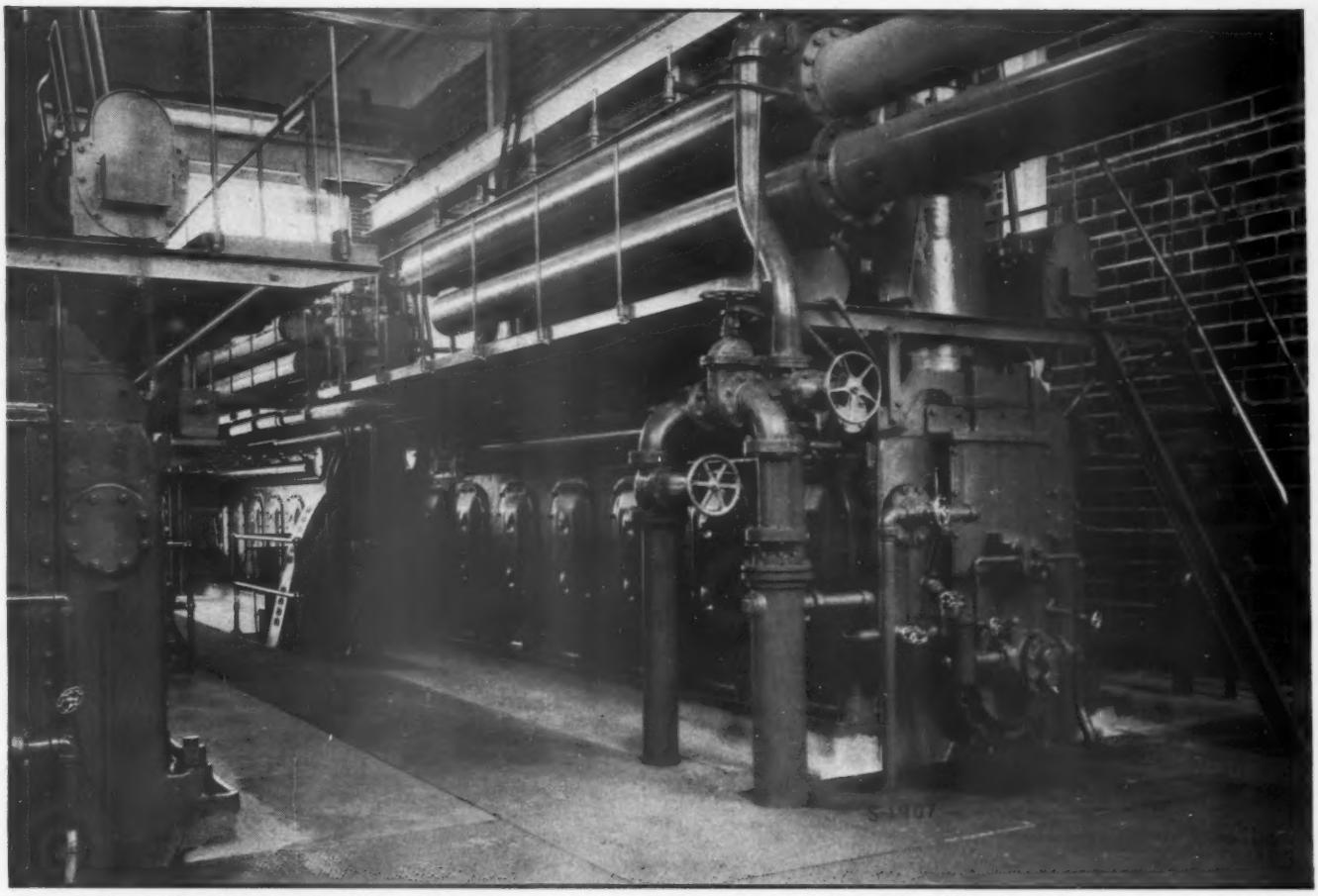
Most pressure regulators in their working can do only one thing, and that is move their valves so as to maintain the pressure constant at that point to which the diaphragm is connected. The diaphragm, of course, operates the valve opening; the diaphragm is influenced by the pressure under it. Hence if we connect the low pressure point in our venturi or orifice to the diaphragm, we maintain the pressure constant at this exact point. The restored pressure is higher than this low point pressure, and this restored pressure is the regulator's immediate outlet pressure at the point where it discharges into the distribution main. Since the amount of the restored pressure above the low point pressure varies approximately with the square of the rate of flow, we automatically make the regulator outlet pressure vary with some function of the rate of flow. Thus at higher flow rates, higher outlet pressures, Fig. VIII illustrates this point schematically.

In actual practise many refinements may be applied to this velocity type of automatic pressure loading equipment. Adjustments may be applied to permit variations in the rate of boost. Limiting devices may be used to prevent the pressure from being raised above a predetermined maximum.

It would seem that the use of an automatic loading device such as illustrated in Fig. VIII, and others of the velocity type, giving a pressure condition such as shown in Fig. VII, would solve our problem quite satisfactorily. Under this system the increase in pressure at the regulator station ½ H is just enough to prevent a falling off of pressure at the low pressure point not to exceed ½ H. Hence we have as low an average consumer pressure as we can have under the high load condition, with the minimum variation at any one consumer.

Unfortunately, there are certain influences at work which make the attainment of this condition impossible in many instances. In many cases we do indeed find the velocity type automatic loading system working just as shown, giving the desired results. In other cases, particularly in distribution systems fed by more than one regulator, we notice an instability which prevents the successful use of automatic loading. If we adjust the automatic loader to the point where it gives a sufficient pressure increase at the regulator outlet, it will suddenly start under certain conditions to increase the outlet pressure at a fast rate and continue to gain momentum until the regulator outlet pressure has gone way above its required value, until whatever limiting device is provided for over pressure is brought into play, and the increase stopped. This "runaway" or swinging tendency is not noticed at all times, but occurs occasionally. Most safety devices stop the action by causing the diaphragm pressure to go up and close the main regulator valves. The flow is cut off, and no gas flows until the outlet pressure recedes to P_1, the weighting of the regulator, and then the regulator will open and the cycle again started. This "swinging" under high load conditions is, of course, very bad on consumer pressure and can not be tolerated.

Let us try to arrive at the cause of this instability. In a velocity type system, we increase the regulator outlet pressure in proportion to the velocity or the rate of flow; this pressure increase in the system illustrated in Fig. VIII is the restored pressure and is proportional to the



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square of the velocity. In other types of velocity loading systems, such as those depending on the differential pressure across an orifice for loading, the same essential fact holds; the increase of pressure at the regulator's outlet is proportional to the square of the flow rate. This means a rather rapidly increasing outlet pressure at the higher rate. Fig. IX shows this relation.

The important thing to notice in this velocity—outlet pressure curve is that it is concave upward. For a velocity of s′ we would theoretically have a regulator outlet pressure of P_1'. Now let us suppose that a fairly rapid load increase due to an approaching peak hour takes place. We will now have a velocity of s′′ and we would also expect a regulator outlet pressure of P_1''. However, raising pressure has some rather complicated effects. If we were to go to any regulator and add weights to its diaphragm at a constant load period, the very act of adding the weights will immediately increase the velocity at least temporarily, although the consumers are not calling for more gas. This synthetic increase in velocity comes from four sources.

First, increasing the pressure on the entire pipe system, requires more gas to meet the new storage requirements of the system, i.e. a given volume at 6 inches of water when raised to let us say 7 inches of water takes a greater *weight* of gas, which requires a temporarily increased velocity at the regulator to satisfy this requirement.

Second, at each appliance that is burning, providing there is no appliance pressure regulator on it, the gas consumption will increase with this new higher pressure. This increased consumption per appliance will be approximately proportional to the square root of the pressure increase.

Third, leaks in the system will increase under this higher pressure; since most leaks are probably sinuous paths through pipe joints, through pipe walls, welds, valve packing, etc., the leakage is probably more nearly proportional to the first power of the pressure increase.

Fourth, the zone of influence of a regulator thus loaded is increased, taking away from adjacent regulators some of their consumers. This, of course, increases the velocity at the regulator.

Here we have four, we might say, *"synthetic"* increases in velocity which have nothing to do with more consumers coming on the line. These increases in velocity again call for an increased pressure (in accordance with the graph in Fig. IX) which in turn would call for an increase in pressure and this in turn for an increase in velocity. We would tend then to have a cumulative action set up which results in "swinging" or "running away" of the regulator.

If the only increase in velocity came from real increasing consumer demand, this would probably not result. Increase in consumer demand plus the four synthetic increases in velocity mentioned above are what gives us our occasional troubles. This occurs at some period in many automatic loading installations, no matter what type of velocity loader is used. The cumulative effect is inherent in this type of loader.

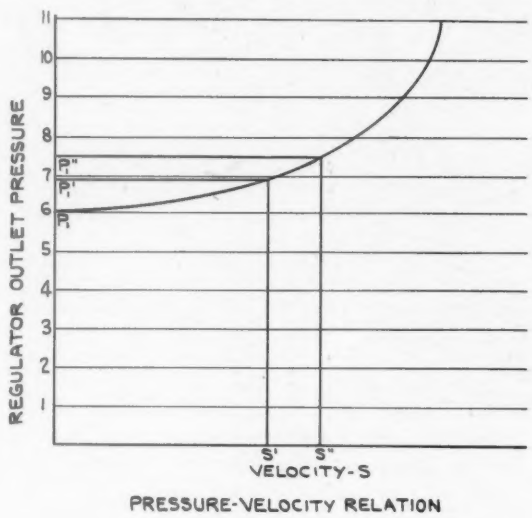


Fig. IX Velocity-pressure relation for automatic loading.

To eliminate this cumulative effect of the velocity-pressure relation, one remedy suggests itself. Let us imagine that it is desired to load a regulator increasingly as the true consumer demand (as against synthetic demand) increased. We might put some sort of accurate flow meter at the regulator and send a man out to watch this meter and give him a schedule of pressure versus rate of flow such as shown in Fig. IX and instruct him to add weights to maintain this relation. As the load increases to a certain amount a weight is placed on the regulator diaphragm, thus raising the regulator's immediate outlet pressure. No automatic loading device is provided. Of course, the velocity increases due to the four synthetic reasons mentioned above, namely, increased storage pressure of the system, increased consumption per appliance already on the line, increased leakage, and extending the zone of influence. However, since the outlet pressure cannot increase of itself, there being no automatic device connected, these velocity effects will arrive at a certain point after a short period of time and increase no further. From that point on the only velocity increase will be true consumer demand increase. There can be no cumulative effect. Again our man looking at the meter, after waiting long enough for the synthetic velocity increase to go to zero, will load the regulator again if his true consumer demand plus the already quieted synthetic effect indicates a higher pressure is required at the regulator outlet. This can be continued loading at intervals until the peak hour has passed and it will be possible to take weights off gradually watching the decrease on the meter. The pause after adding each weight will give the synthetic velocity increases time to become constant and avoid the cumulative action which tends to cause the pressure to swing too high.

Obviously, we can not send a man, a meter, and a chart showing the desired pressure velocity relation to every regulator station. However, we can accomplish the same effect by using a loading system as shown in Fig. X. The new element in this system is an intermittent device, gas operated, which can be arranged to load the regulator at intervals. In effect, the automatic loading device is connected to the regulator for a short period, is set by the flow rate at that time, and is then disconnected from the regulator. The regulator will then function as a simple regulator maintaining a constant outlet pressure in spite of load variation

(Continued on page 68)

PREDETERMINE COST OF GAS PURIFICATION:

"IN ALL CASES WHERE GAS PURIFYING PRACTICES BE SUCH AS ARE RECOGNIZED AS STANDARD . . .

E. J. LAVINO AND COMPANY WILL GUARANTEE A DEFINITE MAXIMUM COST PER POUND OF H_2S REMOVAL USING LAVINO ACTIVATED OXIDES"

How To Get Your Guarantee:

Your own definite guarantee of maximum cost of sulphur removal in your own plant, under your own conditions is very easily obtained. Just send us a note on your letterhead indicating your interest . . . there's no obligation . . . you can see for yourself what savings you can make.

E. J. LAVINO AND COMPANY
1528 WALNUT ST., PHILA., PA.

AN AMERICAN MADE

RECENT IMPROVEMENTS in the material—such as the new patented disinfecting process that prevents growth of fungus mold—makes possible the unprecedented guarantee offer which applies to all Lavino Activated Oxides.

BUYERS BATTLE FOR BARGAINS

The appeal of a bargain is so axiomatic that it needs no proof.

Whether it be aspirins or asparagus there is always a brisk demand for a real bargain.

You can now offer your customers this remarkable bargain—

Automatic Home Heating and Automatic Water Heating at your regular estimate for Home Heating alone

This means that your customer gets—

Automatic Water Heating FREE!

This is made possible by the Republic **HEET-RE-TREEVER**

The Heet-Re-Treever will save enough gas on home heating to supply all the gas needed for the Republic LO-BILL for water heating.

There are many other unique values for your customer and for your company in the Republic **HEET-RE-TREEVER—**

The basement will be much more comfortable.
The floor zone will be warm.
There will be no chimney problem since the chimney is not used.

Be prepared!! Offer the Republic Burner, Heat-Re-Treever, and Water Heater Package and test the appeal of a real bargain in gas service.

Remember this is not a hit-or-miss assembly but an integrated package, designed and sponsored by the manufacturer for the economical delivery of two major gas services.

AUTOGAS CORPORATION

2258 Diversey Pkwy. **Chicago, Ill.**

General Sales Agent **REPUBLIC HEATERS SALES CO., CHICAGO, ILL.**

Home Service — The Glamour Department of the Gas Business

By
Gladys B. Price
Chairman,
Home Service Committee, A.G.A.

IN the early stages of utility home service, it was a pretty well established fact that the value of home service was intangible, that there was no direct way of determining its value, and it was highly desirable that it be intangible. It was a goodwill department created solely for altruistic purposes and was much too pure to be tainted with any commercialism. This was all very well in the Utopian era P.D. (pre-depression), when life was comparatively simple, woman's place was in the home, a two year old automobile wasn't a jalopy, service stations didn't give away booklets on wild flowers, drug stores still sold castor oil, and nothing much was expected of a gas range. But the old order changeth and competition reared its ugly head, money became scarce, merchandising methods changed, and the fight for the consumer's dollar made an Irish rebellion look like a Sunday school picnic. About this time, Home Service began to hear the proverbial male queries, "Where is the quarter I gave you last week?" and "What did you do with it?" Many home service departments were either discontinued or their personnel was reduced. There was no longer any money for altruistic purposes, in fact, there was practically no altruism.

United Effort the Theme

After some ten years of trial and error, changing economic conditions, unstable financial situations and general reorganizing, we find the gas industry realizing that in self-preservation it must unite and go after its share of the consumer's dollar—those few precious dollars left after rent, food and clothing are purchased. Those few precious dollars for which the two largest tobacco companies spend $11,000,000 per year in newspaper advertising, for which the automobile manufacturers, the cosmetic people, the dress designers, yea, even the liquor distillers have gone to super colossal ends to make their product attractive to Mrs. Housewife. Every product must have glamour and appeal. Even the worst smelling soap has the power (so say the advertisers) to ward off that dangerous condition known as unpopularity.

Let's break down and admit that, after all the headaches of the last ten years, we emerge to find our merchandising market made up of women. Women to whom glamour and beauty is as essential as bread and butter. This being true, the appeal to buy a gas range can no longer be one of steel, coats of porcelain, sturdy legs, or heavy hinges. No woman is buying a good durable piece of equipment, when, for the same money, she can have a new fall outfit that will make her look like the picture in Vogue (she thinks). The old gas range will last another year, says she, it always has! If they can put glamour on a bar of soap, it ought to be a cinch to do a job for gas appliances.

GLADYS B. PRICE

Nobody ever bothered to put any glamour on a gas range. It was always the symbol of drudgery, the Simon Legree who typifies three meals a day, the old beastie that must be cleaned regularly or the neighbors will say you're not a good housekeeper, the very personification of "Here I slave over a hot stove."

Modern Range the Keynote

The first step in the right direction was made when the gas range was transformed from a non-insulated, non-heat controlled black cooking contraption to a lovely white porcelain job, and was home service happy? Something to glamourize, at last. Here was an appeal to the natural beauty loving nature of women. Something so simple the salesmen stumbled over it and apologized because possibly this new porcelain wouldn't stand up and last more than 14 or 20 years. Women are sick to death of things that endure—even to husbands, at times. The second big step was the birth of Certified Performance; beauty, efficiency, durability, economy and ease of operation all wrapped up in a gas range. A marvelous job in spite of the fact that there are still people who can't see the amazing sales possibilities of such a product, still those who say, "Well, there they are, if that's what these women want why don't they buy them"; still those commercially minded males who refuse to glamourize their product, and who are content to let the cosmetic people sell their customer on the fact that a series of Madame Blah's beauty treatment will do more to keep her husband than home-cooked meals. This is debatable, of course, but it's an idea.

Home Service the Artist

And just who is going to do this glamour applying job? Obviously, it has to be done by the one and only really tangible sales aid, the only department that understands and thinks as women do, the only department that appreciates women's needs in appliances, the only department that can teach her to use them properly—your home service department. Not the old altruistic, recipe testing gals, but alert, sales minded, practical women who have traded the old intangible factors for new and extremely tangible results based on the actual needs of the industry.

Home service has shared the problems of the gas industry during these trying years, it has made many

changes and many adjustments. The proof of its value and stability lies in the fact that its personnel has increased during depression years, that companies who discontinued departments have reinstated them. Home Service has known for years that beauty, convenience, coolness, time-releasing, vitamin-saving, speed, and cleanliness were much better sales words than durability, heavy construction, temperature regulation, BTU input, and insulation, but they've had a difficult time selling the idea. Every business in the country has been glamourized, including our competitor's, except the gas business. The fundamental feminine instincts are those of home-making, of service to those for whom she cares. A woman's life's job is the care of a family, which certainly includes the preparation of food. Why, oh why, can't we appeal to this already established desire? Why can't we sell youth, beauty, companionship, health, pride of ownership, leisure, economy, and superior meals?

Relaxation the Result

Let's sell leisure instead of work because with a modern gas range it takes less time to do a better job. Let's sell convenience instead of gadgets because it's easier to do the same job. Let's sell better complexions instead of insulation, because of cooler kitchens. Let's sell health instead of BTU input, because of vitamin saving, waterless cookery. Let's sell modernity instead of porcelain, because every woman wants to be modern. Let's sell beauty instead of service drawers and dimensions, because every woman loves and demands beauty. Let's sell golden brown steaks that appeal to a husband instead of 600°F. in 15 minutes, because a woman is more interested in a husband than in mechanics. And why do we insist on glamour for gas ranges? Because the cooking load is essential to the gas industry; because there are millions of antiquated gas ranges that need replacing; because a modern gas range is so superior as a cooking appliance that it's a joy to tell the story.

Give your home service department a chance at being the glamour girl of the gas business because every woman wants to be a good cook, but she doesn't want to look or feel like a cook.

A Tale of Two Ranges

A Dinge Describes a New Technique To Ease Her Ol' Bones and Let Her Sleep

By

T. F. Murphy

Pittsfield, Mass.

Our company serves a suburban territory with a summer colony of wealthy people who maintain extensive estates used as summer homes.

A few years ago a manufacturer's representative called on me with a new line of gas ranges which his company had placed on the market. I asked him what the range would sell for and he stated that the price to the customer would be $565.00. This seemed to me to be an extremely high price for a domestic gas range and I told him that when I entered the gas business twenty-five years earlier our gas range line consisted of two ranges, one selling for $9.00 and the other for $12.00. A person could buy a house and lot in our territory for $565.00 at that time. Finally it was agreed that one of these ranges would be shipped to us on consignment and we would display it for one month on our sales floor.

Within a week the secretary of one of the well-to-do suburban customers called to see me and his first statement was that we probably did not have in stock the type of range his employer wanted. I showed him this $565.00 range and he immediately signed an order for it.

It was installed the following day, and a few days later I received a telephone call from the owner, asking me to make a personal call. I called, assuming that he was having some difficulty with the range, and was pleasantly surprised to learn that he wished to tell me how well satisfied he was. He also related an incident that occurred the previous year at his winter home in Florida.

This winter home at Palm Beach is located four miles from the city gas lines, so with electric service available he installed a modern electric range. It had been in use for a week when he asked his colored cook how she liked the electric method of cooking. Her reply surprised him:—

"No *suh!* Ah suttinly doan' lak dis heah 'lectric stuff. Come nigh dawn ah has t' git up a hour sooner fo' t' git it het up fitten t' hab mah breakfas' on de table promp."

He told the mammy that perhaps she didn't handle it properly and asked his secretary to telephone the electric company to send out a home service operator to instruct the cook on the mysteries of the range.

A few days later he again asked the cook how she liked the range and heard this enlightening comment:—

Yas *suh!* Dat 'lectric stobe work right smart now, Mist' Ben. Befo' ah didn't know jes how to opmerate dat 'lectric traption."

"Well, what do you do now that you didn't know about before?" he asked her.

"Oh yas *suh!* Bein' late wif breakfas am de lastest thing I'se feerd of. Now befoah ah rolls mah poah tiahed bones to mah baid, ah just tuhns on all dem 'lectric smitch knobs an comes mohnin' dat 'lectric stobe she good an het up foh breakfas' gittin'.

"But, Mist' Ben, comes it askin' time, you-all keep you ol' 'lectric stobe and ah takes mah ebah-lovin' gas stobe."

During the year 1929, our company (a small gas company with 12,000 domestic customers) sold five of these gas ranges at $565.00 each.

Since then even though our territory has suffered severely from the depression, we have sold two or three of these $565.00 gas ranges each year.

"CLEVELANDS" Assure You MAXIMUM SAVINGS On Your TRENCHING JOBS!

You take no chances when you put Clevelands on your jobs, whether they are long main lines in the open or short distribution jobs in the close confined areas—compact, yet rugged, with superfluous bulk and weight eliminated, fast, amply powered for the toughest task, and exceedingly flexible and mobile, Clevelands are the "workingest" trench equipment you ever saw or used. Exactly fitted for gas trenching, they save you money on every job, delivering maximum trench footage at minimum cost. Before you dig investigate "Clevelands"—no obligation—write today for specifications and details.

THE CLEVELAND TRENCHER COMPANY

"PIONEER OF THE SMALL TRENCHER"

20100 St. Clair Ave. **Cleveland, Ohio**

One important Cleveland feature that assures low cost trench is truck speed transportation on special trailers. Machines load and unload in 15 minutes.

"CLEVELANDS" Save More—Because They Do More

"CLEVELANDS" Save More — Because they Do More

AMERICAN LAVA CORPORATION

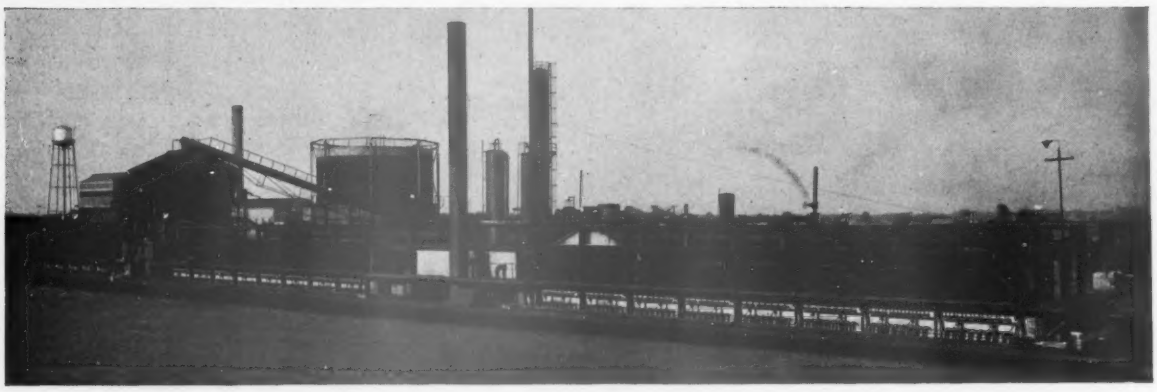
CHATTANOOGA, TENNESSEE

"For over 37 years manufacturers of the finest in burner tips from Lava and AlSiMag".

Non-corrosive! Non-carbonizing! Non-clogging!

Branch offices in principal cities.

CURRAN-KNOWLES GAS AND COKE OVENS



General View of Curran-Knowles Coke Oven Plant at West Frankfort, Ill.

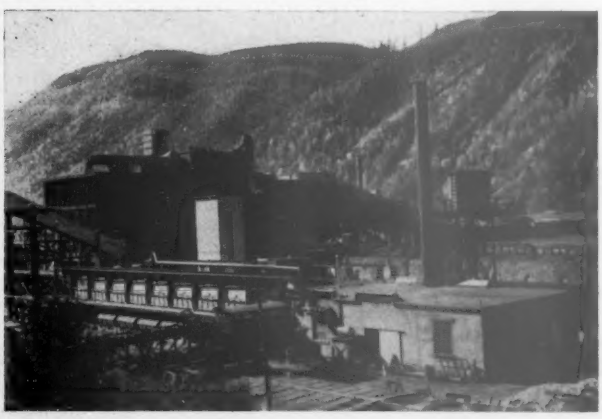
Employ a New High Temperature Carbonizing Process Developed and Installed by Experienced Engineers and Engineering Executives.
At low initial cost per M of capacity, Curran-Knowles Ovens give

1. A high yield of superior quality coke for water gas generator fuel, and for domestic and industrial use. Small size coal screenings can be utilized.
2. A high yield of tar of excellent quality.
3. A uniform quality of gas which meets Commission requirements.

They successfully carbonize low or high volatile, swelling or non-swelling coals.

They are built to suit any situation, —large or small and the simplicity of design makes for low operating cost.

The Midwest Smokeless Fuel Co. Plant near Millstadt, Ill.



In the foreground is installation of Curran-Knowles ovens at Michel, B. C., to carbonize expanding coal.

The Owen Sound plant, for example, requires only 2 men per shift to operate with extra mechanic on day shift to take care of repairs and prepare the coal. Six years in successful operation. Three new plants completed during the past year.

Write for descriptive bulletins showing plants and products.

COAL CARBONIZING COMPANY

BANK OF COMMERCE BLDG. ST. LOUIS, MO.

Pacific Coast Gas Association Holds 46th Annual Convention

THE 46th Annual Convention of the Pacific Coast Gas Association was held in San Francisco, September 6 to 9, inclusive. It proved to be the second largest Convention in the history of the Pacific Coast, there being a registered attendance of 562.

Under the leadership of Mr. H. L. Farrar, President of the Association, a dramatic program was developed, tying in with the Association's theme for the year "Gas on Parade". The delegates were welcomed to San Francisco by Mr. P. M. Downing, Vice President and General Manager of the Pacific Gas and Electric Company, and prominent general session speakers included Mr. R. E. Fisher,

A. E. HOLLOWAY
President 1940

Vice-President in Charge of Sales of Pacific Gas and Electric Company; Mr. E. W. Bowness, Vice President of the Canadian Western Natural Gaslight, Heat and Power Company, of Calgary, Alberta; Mr. William Goodman, Consulting Engineer of Trane Company; Mr. F. M. Banks, Vice President in Charge of Sales and Customers Department of Southern California Gas Company; Mr. Carroll Miller, of Servel, Inc.; Mr. Carl Sorby, Sales Promotion Manager, of Geo. D. Roper Corporation; and Mr. R. S. Agee, Sales Promotion Manager of the Association of Gas Appliance and Equipment Manufacturers.

Over 600 people attended the banquet and dance which closed the Convention.

The Association elected Mr. A. E. Holloway, Vice President of the San Diego Consolidated Gas and Electric Company, as its 1940 President. Elected as Vice President was Mr. R. A. Hornby, Vice President of Pacific Lighting Corporation; and as Treasurer, D. G. Martin, General Auditor of Pacific Gas and Electric Company.

During the Convention Mr. Holloway announced the appointment of Mr. H. J. Smith, of Pacific Gas and Electric Company, as Chairman of the Technical Section; Mr. A. F. Rice, of Southern California Gas Company, as Chairman of the Sales and Advertising Section; Mr. Charles Grunsky, of Coast Counties Gas and Electric Company, as Chairman of the Accounting Section; Mr. Harrison Musgrave, of Southern Counties Gas Company, as Chairman of the Educational Committee; Mr. J. S. Spaulding, of Southern California Gas Company, as Chairman of the Cooperative Advertising Committee; and Mrs. Prudence Hury, of Southern Counties Gas Company, as Chairman of the Women's Committee.

The Manufacturers' Section reelected Mr. R. G. Logue, of the Ward Heater company, and Mr. W. R. Smith, of Continental Water Heater Company, as Chairman and Vice Chairman, respectively. Division officers elected were as follows:

Range Division—R. J. Merritt, Chairman; Ed. Hinchey, Vice-Chairman.
Furnace Division—C. O. Menig, Chairman; R. E. Fraser, Vice-Chairman.
Direct Heating Equipment Division—E. L. Payne, Chairman; Roy Ohnimus, Vice-Chairman.
Water Heater Division—B. A. Hinkley, Chairman; W. G. Cartter Vice-Chairman.
Accessories Division—Hal Singleton, Chairman; A. W. Ray, Vice-Chairman.

The Board of Directors of Pacific Coast Gas Association voted unanimously toward the Addison B. Day Medal of Honor to Mr. James F. Pollard, President of Seattle Gas Company. This award, the highest honor which Pacific Coast Gas Association can confer on its members, was given to Mr. Pollard for the prominent part he played in the organization of a National Advertising Program and for his work in the unification of the gas industry, which has resulted in the affiliation of the

R. A. HORNBY
Vice President 1940

American and Pacific Coast Gas Associations. The medal was presented to Mr. Pollard by President Farrar at the banquet.

The Association's Awards Committee voted Association gold medals to Messrs. B. M. Laulhere and C. F. Briscoe, both of the Southern California Gas Company, for their paper entitled "Partial Dehydration of High Pressure Natural Gas". In addition to the gold medals a number of "honorable mentions" were made. The Association's Basford Trophy, going to the Section judged to have presented the best and most complete program, was conferred on the Technical Section, of which Mr. H. G. Laub was Chairman.

H. L. FARRAR
Retiring President

Report of Awards Committee

The Awards Committee with a full appreciation of its deep responsibility has held several meetings during this Convention and given careful consideration to all of the splendid contributions made to the Pacific Coast Gas Association during the year, including the papers and reports delivered to this Convention.

The Committee was unanimous in awarding a *Gold Medal* to the paper entitled, "Partial Dehydration of High Pressure Natural Gas", prepared by Messrs. B. M. Laulhere and C. F. Briscoe of the Southern California Gas Company. The Committee recommends that the authors of this paper each receive a *Gold Medal.*

Several other papers came very close to a Gold Medal score and the Committee has awarded these papers *Honorable Mention:*

In the *Technical Section,* the Gas Utilization Data Book prepared by a committee headed by Mr. Frank L. Moon of the Southern California Gas Company; the paper entitled, "The Southern Counties Gas Company's Butane-Air Standby Plant" by Messrs. A. F. Bridge and F. A. Hough, both of Southern Counties Gas Company; the paper entitled, "The Application of the Theory of Probability to the Determination of Domestic Peak Hour Loads" by Mr. W. C. Mosteller of the Southern Counties Gas Company; the paper entitled, "A Deflecting Type Orifice Cap for Gas Ranges" by Mr. Morris A. Richford of the Pacific Gas and Electric Company.

In the *Sales and Advertising Section,* a paper entitled "Knowing your Business" by Mr. R. V. Davis of the Southern California Gas Company.

In the *Educational Committee,* a paper entitled, "The Right Man in the Right Place" by Mr. W. R. Davis of the Southern California Gas Company.

While no further awards can be made by the Committee under the rules which govern its procedure, the Committee voted that special mention must be made of the contributions to this Convention by Mr. Carl Sorby of the George D. Roper Corporation and by Mr. R. S. Agee of the Association of Gas Appliance and Equipment Manufacturers. The Committee felt also that the Manufacturers Section of the Pacific Coast Gas Association is particularly deserving of commendation for the splendid contribution it is making toward the solution of the many problems besetting manufacturers in their relation to utility companies and to their dealers and customers. In Mr. R. G. Logue the Manufacturers Section has had a capable leader whose work the Committee particularly commended.

The Basford Perpetual Trophy was awarded this year to the Technical Section, Mr. H. G. Laub, Southern California Gas Company, Chairman.

Addison B. Day Medal of Honor Award Address

In making the presentation to Mr. Pollard, Mr. Farrar said:—

"The Addison B. Day Medal of Honor is the highest honor which the Pacific Coast Gas Association can confer upon a member. It was given to the Association in 1932 by Mr. Addison B. Day, then President of the Los Angeles Gas & Electric Corporation and a past-president of this Association. Its control is vested in the Board of Directors of the Association. It is awarded only for outstanding and distinguished individual service to the gas industry going beyond the strict line of duty. The medal has been awarded three times, first to Mr. Frank Wills of the P. G. & E. for his many important technical contributions, second to Mr. Robert C. Hoyt for distinguished and unselfish service to the cause of gas appliance manufacturers during the trying times of N. R. A., and third to John H. Grayson for inventions in the gas appliance field.

CLIFFORD JOHNSTONE
Managing Director Pacific Coast Gas Association

JAMES F. POLLARD

"It is now my pleasant duty to make a fourth award of the Addison B. Day Medal of Honor. The Board of Directors of the Pacific Coast Gas Association are pleased to tell you that this Association is about to honor one of its members who has made an outstanding contribution, not only to the companies represented by this Association, but to the entire industry of this nation.

"When the recipient of this honor was President of this Association, he accomplished the present affiliation between the Pacific Coast and American Gas Association. When he assumed office, there were members of this Association who were not members of the national Association, and, what was more serious, there were some member companies who did not see how they would be able to continue their membership in both. The possibilities of joint memberships had long been discussed and had actually been proposed once or twice

(Continued on page 69)

Simplified Water Testing for Plant Operators

By

D. R. Hiskey

Southern California Gas Company

NATURE in supplying water to meet human domestic demands has done a perfect job but to the industrial user of water has not been so kind. Generally speaking, the mineral impurities dissolved in natural waters are beneficial and necessary for bodily health, but these same minerals are the cause of trouble when the same water is put to industrial use. The difficulties, their causes, effect and elimination are the subject of this paper.

During recent years much has been done to make it possible for industrial users of water to anticipate the difficulties which water may cause, and to eliminate these possible difficulties by adequate protective measures. It is now possible by the use of field apparatus to make a fairly thorough investigation of the minerals contained in water, and while the results obtained are not as accurate as laboratory figures, they are sufficient to maintain water treatment control based on laboratory analysis.

Tests to Be Made

Field or plant analysis of water by the titration method is now possible to the plant operator and a little practice will make any interested operator proficient in making these practical tests and in interpreting the results obtained, and a little additional knowledge of corrective measures in the case of most waters will permit any operator to maintain efficient water using equipment.

The tests most commonly made are as follows:

P = Phenolphthalein Alkalinity
M = Methyl Orange Alkalinity.
Cl = Sodium Chloride.
G.P. = Ghost Point.
H = Hardness.

Standard Methods of Testing

There have been adopted simple short methods for making plant or field water analyses. The number of solutions are few and the amount of equipment necessary is small. Both can be purchased from nearly any chemical supply house at minimum cost.

Paper presented before the 46th Annual Convention Pacific Coast Gas Association, San Francisco, Sept 6th to 9th, 1939.

The following solutions are necessary to make these tests:

N/50 Sulphuric acid.
N/58.3 Silver nitrate.
Soap solution.
Phenolphthalein indicator.
Methyl orange indicator.
Chromate indicator.

The equipment necessary is as follows:

3—20 cc. Burettes.
3—16 oz. Solution bottles.
1—250 cc. Shaker bottle.
1—100 cc. Casserole.
1—58.3 cc. Graduated cylinder.
Miscellaneous clamps, tubing, etc.
3—Indicator dropping bottles.
1—Small funnel.
1—Box filter papers.
1—Glass stirring rod.

By using 58.3 cc. of water under test, and the solutions above indicated, the results obtained are equivalent to grains per gallon, that is, each cubic centimeter (cc.) of solution is equal to one grain per U.S. Gallon. With the exception of the sodium chloride figure, all other determinations are expressed as calcium carbonate. By interpretation and mathematical calculations the actual mineral content may be determined.

If a water analysis is made or reported on the basis of equivalent calcium carbonate, in grains per gallon or parts per million, it is sometimes desirable to change the analysis as reported to actual weight, but it might be desirable to change to the basis of equivalent calcium carbonate. The calculations for change in weights are based on the reacting molecular weights.

Thus 100 pounds of calcium carbonate has the same reactive value as 80 pounds of sodium hydroxide or 168 pounds of calcium bicarbonate. The reason for using calcium carbonate as the base for expression of equivalent weights is that its molecular weight is 100, thus making its use convenient in calculations.

P—Phenolphthalein Alkalinity

Measure out 58.3 cc. of water (free from suspended matter) into the casserole. (To remove suspended matter, filter solution.) Add 3 or 4 drops of phenolphthalein indicator, which should result in the formation of a deep red color. (If no color change, proceed with the next test.) Titrate with N/50 sulphuric acid, stirring constantly until the color is just discharged to colorless. The total amount of acid used in cubic centimeters represents grains per gallon of phenolphthalein alkalinity.

M—Methyl Orange Alkalinity

To the same sample add 3 or 4 drops of methyl orange indicator which should result in the formation of a yellow or straw color. Add N/50 sulphuric acid, stirring constantly until the color changes to faint orange. The total cubic centimeters of acid required, including that used in the determination of the phenolphthalein alkalinity, represents grains per gallon of total methyl orange alkalinity.

Cl—Sodium Chloride

To the sample remaining from the above test, add about 5 drops of chromate indicator, which should result in the formation of a yellow color. Titrate with N/58.3 silver nitrate, adding the solution slowly with constant stirring. It will be noted that a deep rich red color will form temporarily, which disappears upon stirring. Finally a point will be reached when the red color will not disappear; the first permanent red color indicates the end point. The number of cubic centimeters of silver nitrate solution added represents grains per gallon of sodium chloride.

G.P.—Ghost Point H—Hardness

Measure 58.3 cc. of water to be tested into a 250 cc. shaker bottle (glass stoppered). Add the soap solution in quantities of about 0.20 cc. at a time, shaking vigorously between each addition. A foam will appear on the surface of the water between the additions of the soap solution, but the correct end point will be indicated when the foam remains on the surface of the liquid when the bottle is placed in a horizontal position for 5 minutes. The number of cc. of soap solution used represents grains per gallon of hardness.

In a water containing calcium salts and magnesium salts a false end point may be reached before the true end point—this is known as the Ghost

Point. The foam formed at this time may appear permanent but it will not last the required 5 minutes as above described, also the addition of a small amount of soap solution will cause the foam to disappear completely.

For most accurate results the "lather factor" should be subtracted from the total amount of soap solution used. The lather factor is obtained by the amount of soap required to produce an end point using 58.3 cc. of distilled water for the test. The factor is usually 0.5 cc.

The five tests just described are simple and easy to make and constitute the only tests necessary to be made in any industrial plant in order to maintain efficient water using equipment. However, it must not be construed that these are the only tests which should be made. Before starting any industrial plant a thorough study and a complete laboratory analysis should be made of the water situation in order to determine, if possible, beforehand if there are any constituents in the water that cannot be easily removed or the water economically treated.

Interpretation of Results

Probably to the mind of the average plant operator, the making of any tests relative to water conditioning should be left to a chemist. This, however, is only true in the event of starting a new plant. After the plant is in operation and a method of water treating is established, then by these few simple tests any operator will be able to determine if the proper treatment is being maintained and in so doing he can study the effect of water treatment on his equipment.

While these few tests may seem complicated to the layman, with a little study on the part of a plant operator the interpretation of his results becomes rather simple. The following is a somewhat general interpretation of the results.

Roughly, the phenolphthalein alkalinity represents all the sodium hydroxide or caustic soda and one-half the sodium carbonate content of the water. The methyl orange alkalinity represents all the sodium hydroxide and all the sodium carbonate. From this explanation it can readily be seen that the methyl orange alkalinity subtracted from 2 times the phenolphthalein alkalinity will give the caustic soda or sodium hydroxide content of the water. This is known as the "A" alkalinity. In a like manner, the methyl orange alkalinity minus the "A" alkalinity will result in the sodium carbonate alkalinity; these are expressed as calcium carbonate. The Cl determination represents the total amount of sodium chloride present as sodium chloride. The Ghost Point represents the amount of calcium present and the Hardness (H) represents the total calcium and magnesium present; therefore the difference between the two determines the amount of magnesium.

Using these titrations as a basis, the chemical composition of the principal scale forming impurities in raw water may be determined from the relation of H, G.P. and M. This relation with examples will enable one to classify water into five distinct groups as listed above.

All of the above determinations are expressed as calcium carbonate.

Determination of other troublesome minerals such as iron, alumina, boron, fluorine, and silica should have laboratory attention especially in the case of boiler waters. The laboratory should be consulted to determine, in addition to scale forming minerals, the amount of sodium sulphate present and also the presence or absence of nitrates and organic matter. In ordinary plant control, it is not necessary to make determinations daily or weekly unless the source of water supply is constantly changing, but it is still necessary for the plant operator to know how much of these impurities are present.

1. If G.P. is higher than M, as H = 20; G.P. = 10; M = 8; P = 0.
   H − M = 20 − 8 = 12 GPG Sulphate Hardness (S.H.)
   M = 8 = 8 GPG Bicarbonate Hardness (HCO_3)
   H − G.P. = 20 − 10 = 10 GPG Magnesium Sulphate, $MgSO_4$
   G.P. − M = 10 − 8 = 2 GPG Calcium Sulphate, $CaSO_4$
   M = 8 = 8 GPG Calcium Bicarbonate, $Ca(HCO_3)_2$
   Total Hardness = 20 GPG as Calcium Carbonate
2. If G.P. is less than M, as H = 20; G.P. = 8; M = 10; P = 0
   H − M = 20 − 10 = 10 GPG Sulphate Hardness, S.H.
   M = 20 = 20 GPG Bicarbonate Hardness, HCO_3
   H − M = 20 − 10 = 10 GPG Magnesium Sulphate, $MgSO_4$
   M − G.P. = 10 − 8 = 2 GPG Magnesium Bicarbonate, $Mg(HCO_3)_2$
   G.P. = 8 = 8 GPG Calcium Bicarbonate, $Ca(HCO_3)_2$
   Total Hardness = 20 GPG as Calcium Carbonate
3. If G.P. is equal to M, as H = 20; G.P. = 10; M = 10; P = 0
   H − M = 20 − 10 = 10 GPG Sulphate Hardness, S.H.
   M = 10 = 10 GPG Bicarbonate Hardness, HCO_3
   H − M = 20 − 10 = 10 GPG Magnesium Sulphate, $MgSO_4$
   M = 10 = 10 GPG Calcium Bicarbonate
   Total Hardness = 20 GPG as Calcium Carbonate
4. If M is higher than H, H = 20; G.P. = 10; M = 25; P = 0
   H − M = Negative, no sulphate hardness present.
   M − H = 25 − 20 = 5 GPG Sodium Bicarbonate, $NaHCO_3$
   H − G.P. = 20 − 10 = 10 GPG Magnesium Bicarbonate, $Mg(HCO_3)_2$
   G.P. = 10 = 10 GPG Calcium Bicarbonate, $Ca(HCO_3)_2$
   Total Hardness = 25 as Calcium Carbonate
5. If M equals O, H = 20; G.P. = 10; M = 0
   H − M = 20 − 0 = 20 GPG Sulphate Hardness, S.H.
   H − G.P. = 20 − 10 = 10 GPG Magnesium Sulphate, $MgSO_4$
   G.P. = 10 = 10 GPG Calcium Sulphate, $CaSO_4$
   Total Hardness = 20 GPG as Calcium Carbonate

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434 Installations

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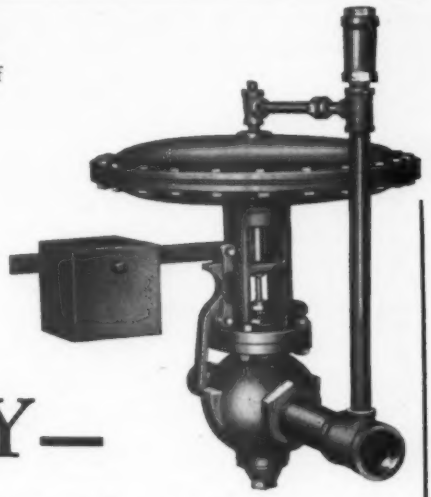

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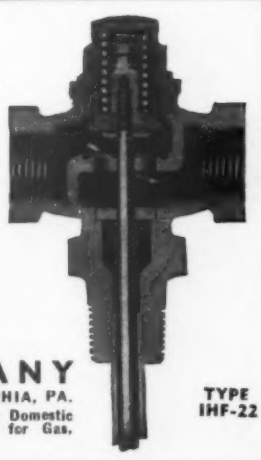

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Pipe Protection*

Current and Voltage Requirements for the Cathodic Protection of Bare Steel in Salt Water

By
Harry J. Keeling
Southern Counties Gas Company

IN December, 1934, a cathodic protection system was started in operation by Southern Counties Gas Co. on a short length of submarine pipeline which supplies natural gas to Terminal Island in Los Angeles harbor. This installation, described briefly in a previous paper[1], protects about 750 feet of 6⅝-inch welded steel pipe wrapped with three coats of coal tar and two layers of asbestos felt applied alternately. Although the line was heavily wrapped, drainage was considered necessary in order to protect it in case the coating subsequently developed breaks or became damaged. While this submarine line is comparatively short, it represents a large investment.

To facilitate drainage, the underwater crossing was insulated from the pipelines on adjacent sides of the channel by means of insulated flanges. The initial cathodic protection installations consisted of a two-cell gravity battery draining approximately 0.4 amperes, which maintained the pipe potential 0.34 volts negative to a rusty iron rod in the soil at the water's edge. In February, 1938, the batteries were replaced by a rectifier which drained approximately 2.3 amperes. In June, 1938, it was necessary to increase the current to 5 amperes to maintain the same potential on the pipeline. The current and voltage have remained substantially the same from that time until the present date, June, 1939.

The rectifier was installed as a result of an inspection made in January, 1938, when there was a —1.6 foot tide which exposed on the north bank approximately 10 feet of the pipe which is normally submerged in salt water. This inspection was made only on the north side of the crossing because the pipe on the south bank of the channel was buried so deeply that it could not be located. At first sight, the pipe coating appeared to be in fairly good condition; however, closer inspection revealed a scarred area of about 1 inch by ½ inch on the upper surface of the pipe at about the —1.5 foot tide level. The coating on this scar was entirely gone and the bare pipe exposed. When additional coating was removed, a pit 0.215 inches deep was found under the coating. In many places red sea worms were imbedded in the outer layers of the coating, and in some cases, in between the layers of wrapping. When the outer layers of covering were removed, sand and mud were found between the wrappers.

Potential data of the pipe at the water's edge were taken during the time of inspection. The pipe was 0.22 volts negative to rusty iron with the gravity battery cathodic protection station turned off, and about 0.129 volts with the station turned on. For these readings the rusty iron was immersed in the salt water immediately adjacent to the exposed metal of the pipe at the water's edge where the pipe potential was read.

Although we reached no definite conclusion as to the cause for pitting occurring on the pipe in spite of the fact that the metal was negative to the water surrounding it, the following possibilities suggested themselves:

1. The drainage provided by the gravity cell was not sufficient. Perhaps a greater potential is required to protect bare metal in sea water than is required in soil.

2. Water may have leaked through holes in the coating traveling laterally for some distance between the layers, so that electrolysis took place between various points on the pipe in contact with this included film of water. The drainage station could not prevent this, since it drained the pipe as a whole below the potential of the ocean, but due to the outer insulating layers of wrapper, was not able to keep the pipe cathodic to the internal layer of water.

3. The pipe coating was damaged at the water's edge soon after it was first laid, and the pitting took place during the subsequent 18 months elapsing before the cathodic protection was started.

The potential drop between pipe and surrounding earth necessary for cathodic protection has been given as between 0.2 and 0.3 volts by various investigators[2]. However, no published data could be found which would give the corresponding potential requirements for the protection of iron in sea water. As a result of the pipe coating inspection, steps were taken immediately to replace the gravity battery with a rectifier which would permit draining more current, and field and laboratory investigations were started to determine the minimum potential necessary for the protection of bare steel immersed in salt water to guide us in the operation of the drainage station on the channel crossing. This report is a resume of the results of our investigation. Although the information found is rather incomplete for the purpose of drawing very exact conclusions, it is presented at this time in order to assist others who may be interested in the cathodic protection of submarine pipelines.

Field Tests

The field tests were conducted by installing 2-inch by 5-inch weighed bare steel coupons in the ocean at the Terminal Island pipeline crossing. Two of these samples were connected by rubber - covered wires to the drained underwater pipeline. One sample was left undrained as a control. The coupons were installed about 100 feet from the shore, and arranged as shown in Fig. 1. A drained sample was located on each side of the pipe so as to show whether there was any difference in the protection received by the side of the pipe nearest the ground electrode and the side opposite the ground electrode.

At this cathodic protection installation, the ground electrode lies on the south bank of the crossing parallel to the pipe and only 20 to 30 feet west of it. Because of the arrangement of the piers, it would be very difficult to increase this spacing. It was thought that perhaps the ground electrode was

Paper presented before the 46th Annual Convention Pacific Coast Gas Association, San Francisco, Sept. 6th to 9th, 1939.

** Pipe Protection Sub-Committee, W. R. Schneider, P. G. and E. Co., Chairman.*

TABLE NO. 1. FIELD TESTS — RECORD OF TEST SAMPLES IN OCEAN AT CERRITOS CHANNEL CROSSING TO TERMINAL ISLAND

Sample No.	Status	Length of Burial, Days	Unit Weight Loss mg/cm²/Year	Ratio of Unit Weight Losses of Undrained Sample to Drained Sample	Average Potential of Sample Catholic to Rusty Iron in Ocean, Volts
11	Drained	60 days	1.8	71.4	0.7
12	Drained	60 days	2.6	50.4	0.7
43	Undrained	60 days	130.6	—	0.07
48	Drained	126 days	1.8	—	0.7
49	Drained	Lost	—	—	0.7
50	Undrained	Lost	—	—	0.07
59	Undrained	129 days	89.6	—	0.0
63	Drained	129 days	1.5	60.5	0.6
67	Drained	129 days	1.2	75.9	0.6
Average	Undrained		110.1	—	0.03
Average	Drained		1.8	62.2	0.65

too close to the pipeline to get an even distribution of current. An attempt was made, therefore, to determine the distribution of current on each side of the drained submarine line by measuring the relative potentials of exploring electrodes placed at various positions in the water with respect to the pipe and ground electrode. No appreciable difference in the potential of the ocean at the different locations was detected. Since the intensity of cathodic protection current is quite low in this installation, and the conductivity of sea water is very high, the voltage drop produced by the drainage current flowing through the water is probably too small to be detected by ordinary means.

The first set of coupons was removed, cleaned, and weighed after the elapse of only two months in order to show us as soon as possible whether the pipeline was receiving sufficient protection. Fig. 2 shows the appearance of the samples as removed from the salt water before they were cleaned. The drained samples were covered with an outer shell of hard sand and calcified matter. The material next to the metal was soft, however, and the metal was bright, with the exception of a few brown discolorations. There was no pitting or other sign of corrosion. The undrained control samples were covered with a fairly uniform covering of rust, and a few patches of hard blistery material. They did not have the coating of hardened cement-like sand and aggregate found on the drained samples. The cleaned samples were rough, and uniformly covered with shallow pits.

The comparative unit weight loss of the drained and undrained samples, shown in Table No. 1, indicated that the submarine crossing was adequately drained. The sample on the side of the pipe nearest the ground electrode lost about only two-thirds of the weight of the sample

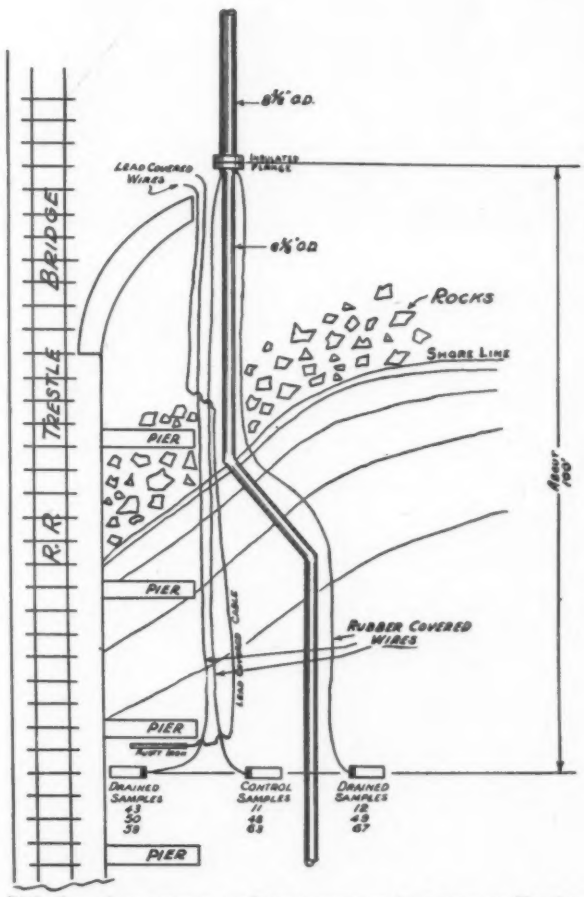

FIG. 1. Arrangement of test coupons in ocean at Cerritos Channel submarine crossing to Terminal Island.

located on the opposite side. However, we believe that this is probably due to experimental error, rather than to any difference due to location, since the unit weight loss was practically of the same magnitude as the experimental error in weighing and cleaning the samples.

A second set of samples was installed in June, 1938, and left in place 128 days. Unfortunately, only one of these samples was recovered. The control coupon and one of the drained samples became entangled with the debris in the bottom of the channel and were lost. However, as shown in Table No. 1, the unit weight loss of the recovered sample No. 48 agreed quite well with the first set.

In October, 1938, the third set of coupons was installed, occupying approximately the same positions as the first two sets. After an elapse of 129 days, this third set of samples was removed, cleaned, and weighed. The appearance of the samples immediately after removal is shown in Fig. 2. Part of the hard shell around the sample No. 67 was removed in order to identify it. The condition of the

FIG. 2. Photographs of bare steel test coupons after removal from Cerritos Channel Crossing to Terminal Island, showing hard coating built up by the effect of cathodic protection. The white deposit next to metal is visible on upper ends of samples 11, 12, and 67, where a portion of the hard deposit has been removed.

samples was identical with the first set; the drained samples were covered with a coating of hardened sand, and the undrained sample was covered with a uniform coating of rust. The unit weight loss of this set of samples agreed quite well with the previous results.

Summary of Field Tests

A summary of the results of these field tests using the three sets of corrosion test samples installed in the ocean is shown below.

Laboratory Tests

The field tests were conducted mainly to check the operation of the cathodic protection equipment on the submarine crossing, and to assure us that the pipe was receiving adequate protection. Simultaneously with the field tests, an investigation was started in the laboratory to determine, with more precision, the minimum potential that we might safely maintain on the underwater pipeline without losing metal. Previous laboratory tests by Allyne[3] indicate that excessive potential on a cathodically protected pipeline is detrimental to the coating and may eventually cause its complete breakdown. It is important, therefore, to maintain only the minimum potential across the coating that will prevent corrosion. The tests in the laboratory were arranged to simulate as nearly as possible the conditions found in the field, so that any conclusions would be directly applicable to actual installations.

Outline of Laboratory Tests

After several preliminary trials, the laboratory procedure finally adopted was as follows:

Weighed steel coupons were arranged in three glass jars, each holding about one gallon of 3 per cent sodium chloride solution. Three coupons were drained and one left undrained for a control. Carbon rods in the upper part of the jars were used as anodes. The drained sample was turned so that its edge pointed toward the anode so that the current density from the face of the sample would be as nearly uniform as possible. The current drained from the samples was determined by measuring the potential drop across 100 ohm resistors connected permanently in series with the samples. All potential measurements were made with a potentiometer so that no corrections would be necessary because of instrument current. Rusty iron rods on the bottom of the jars were used in determining the potential of the drained samples. In one jar, the undrained coupon was used as a rusty iron reference electrode.

Before adopting the final arrangement of the samples in the jars, tests were made with different arrangements of the various components, to be sure that the undrained control coupon would not be anodic due to

Drained Sample No.	Unit Weight Loss mg./sq. cm./year	Drained Sample No.	Unit Weight Loss mg./sq. cm./year
11	1.8	43	130.6
12	2.6	59	89.6
48	1.8		
63	1.5		
67	1.2		
Drained Samples, Average	1.8	Undrained Samples, Average	110.1

Average unit weight loss ratio, undrained to drained samples = 62.2
Average potential of drained samples cathodic to rusty iron in water = 0.65 volts.
Average potential of undrained samples cathodic to rusty iron in water = 0.03 volts.

TABLE NO 2. DATA SHEET FOR LABORATORY TEST OF CATHODIC PROTECTION OF BARE STEEL COUPONS IN SALT WATER (3 PER CENT NaCl)

Test	Sample No.	Status	Length of Test Days	Unit Weight Loss mg/cm²/year	Ratio of Unit Weight Losses of Undrained Sample to Drained Sample	Potential of Sample Referred to Rusty Iron*, Volts—at End of Test	Density of Current Drained from Sample, M.A./sq. ft. at End of Test
A	1	Drained	55	0.8	63	0.470	8.75
	2	Drained	55	0.6	84	0.432	12.4
	3	Drained	55	1.3	40	0.395	7.12
	4	Undrained	55	52.1	—	0.000	0.00
B	1	Drained	20	0.0	Infinite	0.478	15.9
	2	Drained	20	12.6	4.2	0.041	8.46
	3	Drained	20	6.2	8.4	0.144	8.85
	4	Undrained	20	52.6	—	0.000	0.00
C	1	Drained	49	0.1	470	0.344	12.2
	2	Drained	49	0.5	70	0.363	25.2
	3	Drained	49	1.5	24	0.496	111
	4	Undrained	49	37.7	—	0.000	0.00

Dimensions of coupons = 1.5 inch by 0.5 inch by 0.0625 inch

*Undrained sample was used for rusty iron in jar 1, which contained samples 1 and 4.

the current discharged from the carbon anode. It was found that by using small coupons in a fairly large jar, putting the anode and cathode near the top, and the undrained sample and rusty iron electrode on the bottom and insulating the rusty iron connection which passes upward through the solution, the potential of the undrained control sample would not be affected by the drainage current. With this arrangement of the equipment, the results as found by the laboratory tests should apply directly to field conditions tested by our customary methods.

Complete data for the laboratory test are shown in Table No. 2. In the last test, C, an attempt was made to hold the drained coupons 0.4, 0.5, and 0.6 volts cathodic to rusty iron to check the approximate critical voltage necessary for protection as found in tests A and B. Although readjustments of the voltages were made about a week after starting the test, to allow the conditions to become stabilized, the final voltages were about 0.3, 0.4, and 0.6. Since, on test A, only the final voltages were

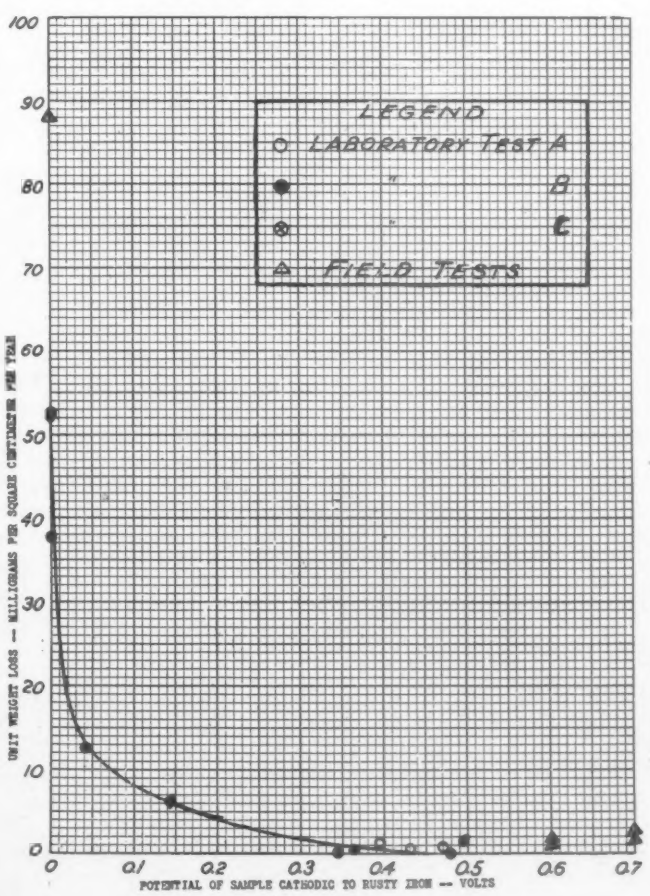
LEGEND
LABORATORY TEST A
" B
" C
FIELD TESTS
UNIT WEIGHT LOSS — MILLIGRAMS PER SQUARE CENTIMETER PER YEAR
POTENTIAL OF SAMPLE CATHODIC TO RUSTY IRON — VOLTS

FIG. 3. Results of laboratory and field tests showing effect of potential on the weight loss of bare steel in salt water.

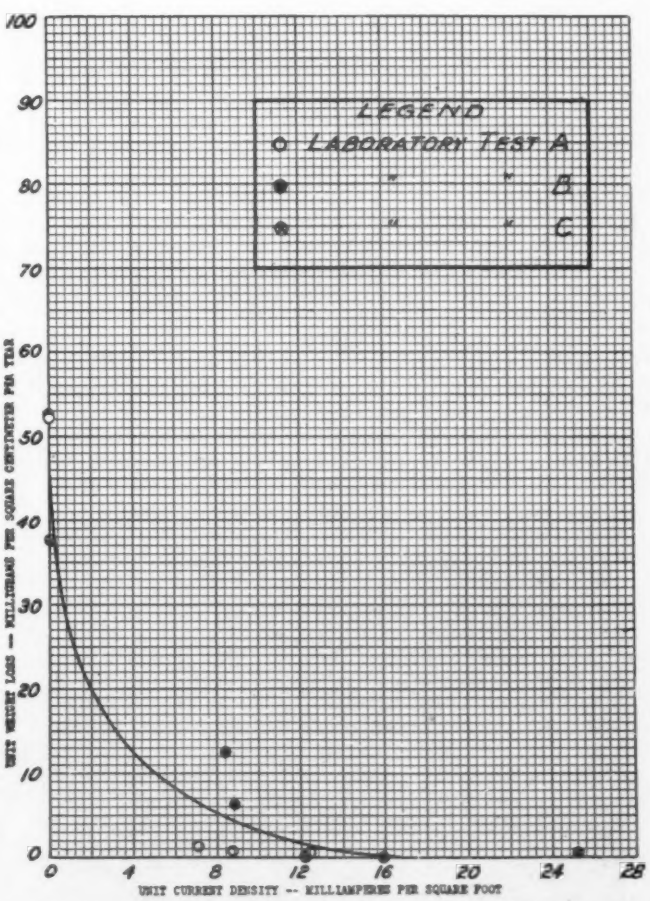

FIG. 4. Results of laboratory tests showing effect of current density on the weight loss of bare steel in salt water.

read, for the sake of uniformity, the curves were all plotted with reference to the final voltages and currents.

Discussion of Data from Laboratory and Field Tests

The unit weight loss for the bare steel samples, as determined by the laboratory tests, is shown plotted with respect to voltage in Fig. 3, and with respect to current density in Fig. 4. The data obtained from the first two sets of samples, laboratory tests A and B, form a fairly smooth curve in Figs. 3 and 4. The data for the last set of samples, laboratory test C, do not agree quite as well, however. The results of the three sets of test samples removed from the Terminal Island crossing have been included in Figs. 3 and 4 to show the close correlation between the laboratory and field tests. The unit weight loss represented by the plotted points in the region of the 0.4 volt and 10 milliamperes per square foot ordinates is only about 1 milligram per square centimeter per year. This corresponds to an actual weight loss of 20 milligrams or about 0.03 per cent of the total weight of the samples.

The curves of Figs. 3 and 4 may not be justified by the few plotted points. They were drawn merely to show the trend of the data rather than to illustrate an exact natural law. The voltage curve, Fig. 3, is applicable to wrapped lines when the area of metal exposed to the water is not known. The current density curve, Fig. 4, is useful in calculating the total current required to protect a bare line in salt water. When a bare line is first drained, the current required for protection may be greater than the values shown on Fig. 4, because the metal will not initially have the salt coating which restricts the current flow.

Conclusions

The tentative conclusions drawn from the tests to date are as follows:

1. The average potential required for the complete cathodic protection of bare steel in sea water is about 0.5 volts referred to well-rusted iron immersed in the water, with possible extreme values of about 0.35 to 0.7 volts.

2. The average unit current density required for the complete cathodic protection of bare steel in sea water is about 15 milliamperes per square foot, with possible extreme values of 7 to 25 milliamperes per square foot.

3. A bare steel surface receiving cathodic protection in sea water becomes coated with a fairly hard salt which gradually reduces the required current density necessary for complete protection.

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(2) Thayer, Starr, "The Development and Application of a Practical Method of Electrical Protection for Pipe Lines against Soil Corrosion," Natural Gas, 1933, and Proceedings of American Gas Association, 1933.

(3) Allyne, A. B., "The Effect of Electric Drainage on Bituminous Coatings," Proceedings of Pacific Coast Gas Association, Volume 25, 1934.

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The burners are hexagonal in section (2⅝″ across flats) with 1-1/16″ diameter bore (the hexagonal form permits denser tamping of the moist refractory.) They are straight for 43″, then turn at right angles for 5″ to the port end. The 3″ pipe collar on the inlet end is water cooled and bricked into the combustion chamber wall. Attached to the collar is a high pressure inspirator fitted with a 0.052″ spud. The gas here inspirates but a fraction of the air needed for combustion. Some 95 per cent of the required air is supplied as secondary air within the kiln and is preheated to 2000°F. by the fired ware as it gradually cools to room temperature during the latter part of its 72 hour cycle.

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Personnel Luncheon Conference at A. G. A. Convention

The Committee on Personnel Practices of the American Gas Association will hold its Fourth Annual Luncheon Conference in the Small Ballroom of the Hotel Pennsylvania, New York City, Thursday, October 12, at 12:30 o'clock following the third general session of the Association's convention. Arrangements have been made by a subcommittee headed by Charles G. Simpson of The Philadelphia Gas Works Company. The conference provides a forum for those concerned or interested in personnel work.

The Chairman of the committee, W. N. Bissell, of the Niagara Hudson Power Corporation, will preside and the speaker will be J. Walter Dietz on the subject "Today's Trends in Industrial Relations." Following the address, the conference will be given over to discussion, a popular and interesting feature of past conferences.

Mr. Dietz, an engineer by training and personnel relations manager of Western Electric Company's manufacturing department, has followed the evolution of industrial relations from its earliest beginnings. He will explain in his talk the new emphasis that is being placed on the personnel problems of management. From both the operating executive's angle and the personnel point of view, new techniques have developed in this field. How these can best be used in solving today's problems, to the mutual benefit of workers and companies alike, will be illustrated by Mr. Dietz.

Mr. Dietz has also been active in the American Management Association since its very beginning and now is vice-president in charge of the personnel division. As a member of the Federal Advisory Committee for the U. S. Employment Service, he has assisted in their occupational research program. He was recently appointed to an advisory committee formed to assist President Roosevelt's Committee on Civil Service Improvement.

Tickets for the Luncheon Conference should be obtained in advance from the American Gas Association, 420 Lexington Avenue, New York, N. Y.

"We are going straight ahead"

ONE might conclude, from hearing people talk, that this country is *built*, that its opportunities are gone, its resources exploited.

Not one word of that is true! U.G.I. believes, in its particular field at least, that the job is far from finished. Opportunities are limited only by fear and hesitation.

The future is bright for those who will not permit temporary inequities of taxation or restriction, temporary business nose-dives to blind their eyes to these facts: We live in a land that is under-populated, under-developed, a land that needs look to no other land for raw materials or markets. We live under a system of government established by our forefathers on the basis of equality. Only in America do the masses constitute the major markets for luxuries as well as necessities. We live with people who are going places.

U. G. I. is going straight ahead. It has an undertaking — as binding as a written and sealed contract — to reward its stockholders with reasonable earnings, its customers with service, its employees with jobs, the general public with the wide and far-flung benefits of business well-managed, work well done. In a country such as this, it is conservative to be progressive.

THE UNITED GAS IMPROVEMENT COMPANY

Dedicated to Better Public Service Since 1882

Building A Promotion Program

By
Wm. H. Matlack
Champaign, Ill.

NECESSITY is said to be "the mother of invention," and any gas man that is now confronted with the necessity of increasing the use of gas by his present customers and adding new customers must resort to invention.

The sales department must invent a plan to attain these increases forthwith. The activity must be predicated on an intensive promotion* for the sale of more gas-consuming appliances and an increased use of existing appliances and, therefore, gas by present consumers. Such a plan would also include adding new customers to existing distribution systems.

In laying out a program of this kind (we are talking only of domestic customers in this article), the first thing to do is to determine the annual objective, what we are striving for in the matter of an increase in M.C.F. or therms sold.

In promulgating such a plan we must remember that the gas business is highly competitive today. Not only are we in competition with other agencies selling cooking, water heating, refrigeration and cooling equipment, but we are in direct competition with thousands of other agencies, including taxing bodies, for the customer's dollar.

This being the case, we must put aside that old reserve, that poise of the staid conservative business man or engineer and become a showman. We must put on a better show than the other fellow if we expect to even get a look-in at John Q. Public's dollar.

If revenue from the sale of gas is dropping and the number of customers is at a standstill, the only chance we have to maintain and increase our load is through an intensive promotion plan, and when we say intensive we mean *intensive*. Putting on a show, giving our public more "umph," more glamour, more showmanship. Showmanship is the age-old tool for getting attention, creating desire and loosening purse strings —for the purchase of anything.

If you, Mr. Reader, can concede to this and you are planning a "recovery program," you are ready to go. (We assume you have an analysis of customer usage, appliances on your lines, etc.). Your first task in projecting your activity would be to consider the main elements of your plan under the following subdivisions in order to know definitely what you are striving for and what elements you would have to give consideration to in order to attain that objective.

In your first projection your main considerations would be given to Annual M.C.F. sales and Gross Revenue, and you would make your projection under the above subdivisions.

Appropriation for Promotion

With the foregoing data at hand you would be in a position to set up your total promotion budget for the year and to break it down by months and appliances, depending on how your sales calendar is set up, and after determining to what extent promotion is to be given the various appliances.

Research indicates that the figure of three (3) percent of Gross Merchandise Sales is the one used by the majority of companies for merchandise promotion, (The promotion of a specific appliance), and that anywhere from seven (7) to fifteen (15) percent of the Gross Revenue is applied to new business promotion, (the promotion of usage of service via a modern all-gas home, etc.).

The appropriation for promotion throughout is based on gross revenues. In other words, as it will be seen, to secure an increase in the use of gas per customer, greater promotion has to be applied to usage of present equipment in the customer's home and the added use of service through the purchase of additional appliances. Such promotion as may be applied to increased usage of present appliances would be charged to the new business account, while promotion employed to sell a specific appliance would be charged to the merchandise account.

However, these factors will be covered in an article to follow and in connection with the method of building a sales drive.

Estimated Sales and Gross Revenue

Appliance (kind) Quota (Units) % Saturation Annual M.C.F. E.A.R.$ Gross Rev.$

You would then project your plan to show the revenue to be derived from the sale of appliances in the following fashion:

Merchandise Sales

Appliance (Range)	*$ Per Unit (Cash Price)*	*Quota Units (Per Year)*	*$ Sales (Units x Cash Price)*	*Sales Per Customer (Customers) ($ Sales)*

*Promotion, as we apply the term, applies to all forms of advertising, including newspaper advertising, window and store displays, etc.

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100 lbs. ASME Code
¾ to 45 H.P.

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AGA Approved TITAN Temperature and Pressure Relief Valve

This device is installed on the hot water outlet in the tank directly in the flow of water. Action, as a result, is unfailing and positive, there being no dead pockets to prevent proper functioning of relief valve.

Pressure relief is obtained through a spring-loaded valve which opens when the pressure reaches a predetermined point. Should the water become overheated to 200° F, a fusible disc melts and lets the water escape thereby preventing a further increase in temperature.

The Titan Relief Valve serves as a coupling connected in the line thereby eliminating the necessity and expense of a tee fitting. To replace fusible disc, it is not necessary to disassemble valves or piping in any way.

Design for application to storage or range boilers. Prevents corrosion, scalding and explosion.

Catalog and full information upon request.

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9913 Elk Avenue Cleveland, Ohio

All sizes up to 3,400 cu. ft. capacity

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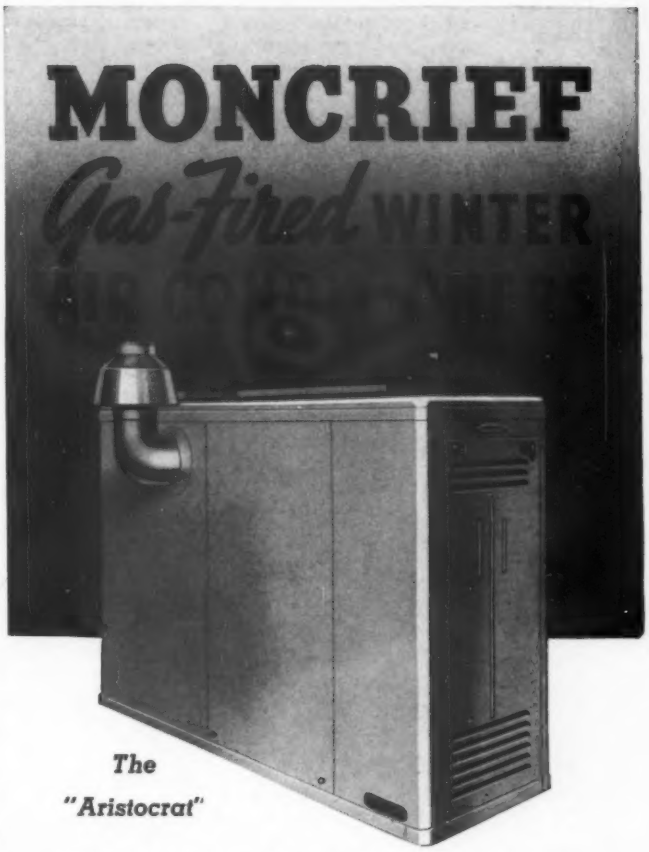

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Automatic Operation Gives Carefree Comfort

• You can fully meet the most exacting requirements of homeowners and builders with the modern Moncrief line. All units are smartly styled and include every feature that contributes to high efficiency and economical fuel consumption. Combustion sections and flue economizer are made of heavy cast iron for durability and safety.

The "Aristocrat" is equipped with two-speed motor with overload cutoff, Automatic June Humidifier, Humigrad Room Control, Chronotherm, and many other superior features.

The "Special" is a completely equipped high-efficiency unit, priced for the average home.

The "BAC" is quality made and priced to give exceptional volue.

Also, there is the Moncrief Gravity Gas Furnace, of the same high-quality cast-iron construction as Moncrief Winter Air Conditioners.

All are approved by the A. G. A.

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MONCRIEF ENGINEERING SERVICE *is freely available* for estimating and laying out installations.

THE HENRY FURNACE & FOUNDRY CO.
3484 E. 49th STREET CLEVELAND, OHIO

A Brief History of the Natural Gas Operations of Glenn T. Braden and Associates in Oklahoma—1905 to 1921

Part 2

By
R. H. Bartlett

I was always very optimistic in those days and I felt sure we could raise the $20,000 in a few weeks, having in mind the oil checks which were coming in each week for Mr. Braden. I told Mr. Chaplin that I was going down and get a couple of thousand of their stock checks, have them printed payable to bearer, in Two's, Five's and Ten's and Twenty's, sign them for the company and ship them to Mr. Hastings to pay off the labor. Chaplin just laughed at me and said, "I don't believe they will take them and I think you are just wasting your time." However, he failed to tell me not to do it. I ducked out of his office, secured the blank checks, took them to a printer, urged a rush job and received the checks at my office that afternoon. I started signing checks that afternoon, took them home with me, signed all evening and got up early in the morning and finished them, then sent these $20,000 of pay checks to Hastings, wiring him that the checks were on their way. When they arrived at the Tulsa office, his secretary, Andy Brink, made up the payroll and took them out to the camps.

The fact that the Oklahoma banks were closed, made a good excuse for our move. The situation was explained to the interpreter, and the foreign labor accepted them without a murmur, and as far as the payroll was concerned, the deal was closed.

The matter went along about a week, with a few scattered checks coming into the Colonial Trust Company, which we covered. One morning about ten days after I had mailed the checks, I heard a commotion in the hallway outside my office, which was on the 22nd floor of the Farmer's Bank Building. The door opened a little way and three or four heads were peeking in and I heard a great deal of foreign chatter and laughter. Instantly I knew what had happened. This foreign labor had taken a train and come back to Pittsburgh. My nerve nearly forsook me at the moment; but I got up, opened the door wide and looking down the hall saw some thirty to forty chattering foreigners jamming the hall. I asked if there was an interpreter and a little short man stepped out; and in broken English, explained he was an interpreter, so I told him to invite the men into my office. Of course, we did not have sufficient chairs for all of them and some had to sit on the floor, completely filling the office.

I then went into the next room and conferred with Brother John. Mr. Braden—or the Braden Oil Company—was operating in Illinois, and that morning had a $2,000 balance in the Union National Bank of Pittsburgh; and it so happened that this bank had been paying out cash until the clearing house had to notify them to stop it. In other words, this was a very wealthy bank, which had secured a large amount of currency from New York in anticipation of this panic; and they had made up their minds to make a record in the Pittsburgh district by continuing to pay currency to their depositors until the clearing house shut down on them, because it was a reflection on the other banks in Pittsburgh. Knowing these circumstances, I told Brother John to write a Braden Oil Company check for $2,000, go down to the Union National Bank, see Mr. John R. McCune and explain to him the circumstances, tell him that we had this crowd of foreigners in our office with these pay checks in their pockets and that we actually needed at least $2,000 to pay them off. I then told one of the clerks, Fred Roebling, to come in and start with a pad of paper, taking all the time he possibly could, and go around the room figuring up the amount of checks each man had. I was sparring for time. In the meantime, I told John to get this money in bills of small denomination and to bring it in and pile it up on my desk. I returned to my office to explain to the interpreter what Fred was doing.

Meanwhile, these foreigners were still laughing and chattering. I asked the interpreter what it was all about, and it seems they had had quite a time coming up in the elevators. They had never been in a high building before and they were all afraid of the elevators. As far as these foreigners knew, we might have had a million dollars in the bank, and fortunately, they never knew any different.

Before Brother John returned from the bank, another funny incident happened. Mr. Braden and Mr. Barnsdall came in, not knowing anything about my callers. Mr. Braden always came into my office to walk through to his office, but he just took one look at my callers and started for the other door. Mr. Braden's office also had a door into the hall. I knew they would beat it out of his office and down the elevator, so Mr. Braden and Mr. Barnsdall went back into Mr. Braden's office and shut my door; but I immediately got up, opened the door and caught them just as they were going out the other door. Mr. Barnsdall said, and he

laughed as he usually did, no matter what or how trying the circumstances might be, "How much will it take to pay off your foreigners?" I told him we had estimated it would take at least $2,000, so he said he would go down the street and get $2,000 in currency for me. However, I thought that was just an excuse to get away, as, at that time, Mr. Barnsdall couldn't cash his check for $25.00. I returned to my office and in three or four minutes in came Brother John and began emptying his pockets of the $2,000 in bills of small denominations, just as I had told him. We counted out this money and began paying the men. About ten minutes later, before we had finished, Mr. Barnsdall came in with his pockets full of currency and put it on my desk. I slowly counted this money, putting it in piles and we paid off all the men and had $300 left. I then explained to the interpreter that these checks could be used with the merchants in the mill districts and that it would not be necessary for them to come direct to the office with the checks. The matter of the elevators was a help to me in this regard, because the men were afraid to ride in them, and, therefore, we had no further trouble with any of them coming direct to the office.

A day or two later, however, a group of them landed in the office of the Colonial Trust Company, all of them with a hand full of checks, not only of their own, but their friends; and Mr. Chaplin called our office. Naturally, he was very excited and very much out of patience with me and I got a calling down, such as a banker can give you under such circumstances. Mr. Braden happened to be in his office and I finally turned him over to Mr. Braden, who laughed and told Mr. Chaplin to pay them off and get them out of the bank, which was the only thing that could be done under the circumstances; and that was exactly what they had started to do, even before Mr. Chaplin got on the telephone. From day to day we kept trying to cover this account; but some days it was impossible and they had to carry an overdraft to the next day. A few day's later a big batch of these pay checks came through the Clearing House, the Colonial Trust Company having marked them "NSF" (not sufficient funds) and returned them to the Clearing House. However, the Clearing House Association returned them with instructions to pay them whether there was sufficient money or not in the account to cover them. The next morning I received a call from Mr. Wilson A. Shaw, President of the Bank of Pittsburgh, N. A. asking me to come right down to his office. I went there, thinking perhaps Mr. Shaw was going to buy some of our bonds, but much to my surprise and chagrin, I received another lecture from Mr. Shaw on the dangers of sending out checks without having sufficient funds in the bank. I waited until he had talked to me for about ten minutes and then when he was finished I told him the details of the story which I have recited herein. Before I had finished, a smile began to curl around his mouth, (it seems that Mr. Shaw was President of the Clearing House at that time, and the Secretary had reported to him about these pay checks having been sent back to the Colonial Trust Company). When I had finished my narrative, he stood up, shook hands with me, and after I had carefully explained that the account would be taken care of from day to day out of our oil checks, he cautioned me never to do a thing of that kind again. He said I might have thrown the entire Pittsburgh district into a panic and ruined the practice of the pay check system. I went back to my office feeling rather uncomfortable, but happy that the interview was over. A few days later I received another call from Mr. Shaw and went to his office with a great deal of foreboding, feeling that I was in for another lecture; but, much to my surprise, Mr. Shaw greeted me very cordially, began to ask about our bond issues as to how many we had sold, etc., and finally wound up the conference by purchasing $35,000 of our bonds. This was the turning point, and with Mr. Shaw as a recommendation, having purchased this quantity of bonds, we began to move them much more rapidly.

About this time, I made a connection with a young bond salesman from Boston by the name of Samuel Upham. It seems that Upham had been to Oklahoma in the interest of placing a bond issue on a small refinery, and while here he had found out about this Oklahoma Natural and its bond deal. He wired me from Tulsa asking for a contract to market $100,000 of our bonds on the usual broker's commission, and I wired him to go ahead and market $25,000 of these bonds, and that if he succeeded in doing that in a reasonable length of time, we would make a contract with him for $100,000. The next day I received a wire from him with instructions to ship $10,000 of bonds with sight draft attached to an Oklahoma bank for the account of an oil man, then a day or so later I received another message from him from St. Louis, with instructions to ship $15,000 more to a business man in St. Louis. The following morning, he walked into our Pittsburgh office, introduced himself, and we promptly made this contract with him. He took a desk in our office and started in to market the bonds. He was a great deal of help to us because he knew just exactly what to do in a deal of this kind. We had to advance him some expense money; but on the strength of his showing, we were eager to do this. The result was that a little later he organized a group of Western Pennsylvania and West Virginia oil men, chartered a special car and brought them to Oklahoma. They drove to the Hogshooter Field, where some gas wells were blown open and tests made to show them the volume. They also had a banquet for them in Tulsa and one in Oklahoma City. Mr. Upham did not attempt to sell them any bonds until they were on the train starting back for Pittsburgh; and at that time he wired me to find out how many bonds were available for sale. When this group of men reached Pittsburgh, Mr. Upham had the balance of the bonds oversubscribed. Among this group which came to Oklahoma on that trip were such men as Thomas Chestnut, Ed. Durham of Sistersville, W. Va., and several other men who later returned to Oklahoma and made fortunes in the oil and gasoline business. All of these men made nice profits out of the stock which they received as a bonus with the bonds, and the bonds were all eventually paid and retired.

For several years the scattered gas wells north of Sapulpa and north of the Glen Pool supplied the Oklahoma City system. In 1909 a gas well was drilled near Mounds, Oklahoma, by Mr. Harry Sinclair of Independence, Kansas. The Oklahoma Natural purchased this well and about 4800 acres of gas leases from Sinclair and extended a 10″ line to the Mounds field, connecting with the Oklahoma 12″ line at a point near Kellyville, Oklahoma. At about the same time we started to build the compressor station at Kellyville, which was completed in 1910, the first gas station to be built in Oklahoma. This station picked up the gas from Mounds and north of Sapulpa and increased and equalized the pressure in the 12″ line to Oklahoma City. All these cities and towns on the Oklahoma 12″ line were increasing in population and we had a pretty hard time to keep up the pressure on the lines in winter. I believe in 1911 we opened

the Collinsville gas field and extended the Oklahoma 12" line north, passing just east of Tulsa to Collinsville gas field. We also built a smaller compressor station at Collinsville. Tulsa was growing faster at this time, than any other city in Oklahoma. Its population had increased, by 1910, to over 28,000. We made a connection east of Tulsa with this new Oklahoma 12" line and the Osage & Oklahoma Company purchased gas from the Oklahoma Natural, especially in winter, as the old field in the Osage could not supply Tulsa demand.

In 1906 Mr. Grant Stebbins of Tulsa drilled a gas well east of Tulsa along Federal road, just east of the Kendall College grounds, Kendall College was moved here from Muskogee in 1907. The O & O Company purchased this well and took up a large block of leases east of Tulsa. They drilled quite a number of gas wells about where White City now is located. There had been a brick plant built at the east side of what is now White City. The O & O Company built a 6" line from Tulsa to the eastern field to augment their supply from the Osage. The brick plant was shut down soon after starting and the O & O Company purchased this building and the steam boilers and engine, and converted it into a gas compressor station. This was called the Braden Station, and it pumped gas into Tulsa for many years.

In 1910 Mr. Glenn Braden who, for several years, had been President and General Manager of both the Osage and Oklahoma Company and Oklahoma Natural, purchased the Caney River Gas Company from the Devonian crowd. This was an individual purchase; and although a group of his friends in Pittsburgh including myself, took a part of this stock, Mr. Braden owned control and became President and General Manager. I was elected Vice President and Treasurer. John C. Bartlett, my younger brother, was Secretary and Assistant Treasurer. My younger brother had been with me in the Pittsburgh office since 1906 as Auditor and Assistant Treasurer of these companies.

During these few years Mr. Braden kept buying stock of the Oklahoma Natural, as well as the Osage and Oklahoma Company, largely from Mr. Barnsdall, until Mr. Barnsdall sold out all his holdings and Mr. Braden became the largest stockholder in all three companies above described. By 1910, these supplied nearly all the largest cities and towns in the new State of Oklahoma.

In the development of the Collinsville Gas Field, Mr. Braden formed the United Fuel Supply Company, which company developed the Collinsville field and for several years sold the gas at the wells to the Oklahoma Natural and Caney River Company. After purchasing the Caney Company, Mr. Braden began extensive drilling operations around Bixby and Haskell, developing a number of small gas pools. Caney, in about 1911 or 1912, built an 8" line from their main line west to the Bixby field and also a compressor station near Bixby. This line was a little later extended north and connected with the Oklahoma 12" east of Tulsa, with connections arranged so that gas could be passed either way, as demands required, direct into Tulsa from Bixby or into Tulsa from the Oklahoma 12" or from the Oklahoma 12" south to Bixby and on to Muskogee, or southwest to Kellyville. It was a three-way proposition and the companies bought gas from one another, according to demands and production. From about 1912 on Tulsa received the best service of any of these Oklahoma cities, as she was at the junction of these three supply lines.

In 1912, the Cushing field was opened by Tom Slick and B. B. Jones of Bristow. A large amount of gas was developed just above the oil sand. The Oklahoma Natural purchased gas rights on various acreage in this field and drilled numerous wells just to the gas sand. In 1913, they constructed a 12" line south to the Oklahoma 12". This line connected at Depew. Owing to the fact that the oil producers drilled right through this gas sand to get their oil, an enormous amount of gas was blown to waste. In fact, for over a year, the air around the Cushing field was so thick with gas, the men did not dare light a match. In fact, the few autos which drove into that district had to extinguish the lamps at night for fear of an explosion, and people living in that district had to go without lights unless they were fortunate enough to have electricity; and electric lights were a rarity.

The pressure went down so fast in this field that the Oklahoma Natural had to build a gas compressor station in 1914. This was located at Shamrock.

This waste of gas in the Cushing field created a very heated controversy between the oil producers and officials of the Oklahoma Natural Gas Company. The Company had been paying 2c to 3c for gas at the well, and the oil producers demanded 5c or they would let the gas blow. At that time there was upwards of 400,000,000 cubic feet of open flow volume in this field and only about 20,000,000 cubic feet market, so the company could not have bought more than 5% of the potential output if it had supplied the entire market from this field. Most of the wells had been drilled without casing off this gas, and were not in shape to deliver to the gas companies' lines. The oil men refused to put in another string of casing in order to shut the gas in, and so the controversy raged. The Oklahoma Legislature was in session and the oil men went to Oklahoma City and presented a strike bill against the gas pipe line interests. This bill required the gas companies to purchase ratably in every gas field. We didn't think this was just fair, as we had to carry large reserves in all the gas fields and the proration at times would have been so small it wouldn't have paid to connect up every well and set so many large meters. In fact, it would have just about ruined the gas business, unless gas could have been sold for $1.00 per M. More than that, the bill did not guarantee conservation. The result was, the gas interests had to appeal to the Federal government, as the State legislature was all against us. The result was a conservation bill was finally passed after the Federal government sent representatives of the Bureau of Mines to Oklahoma and the mud laden process was developed.

About this time the Okmulgee field was developed with quite a lot of gas and the Oklahoma Company extended its Mounds' line south to it. This gas all came into the Kellyville Station.

A little gas was developed south of Bristow and the Oklahoma built an 8" line to this field. Not much gas was ever taken from it, however.

By the winter of 1915 and 1916 a large amount of oil and gas had been developed in the Osage on the Foster blanket lease. This Foster lease was expiring in March, 1916, and in January, 1916, a large delegation of Osage operators went to Washington to renew it.

During the previous few years before 1916, Mr. Chas. Page had built the town of Sand Springs and had brought in quite a number of industries. He had several very valuable oil properties which were bringing him in a substantial revenue, such as the famous Tommy Atkins lease; also a nice pool of oil around Bruner station on the Sand Springs road. He also had some gas wells;

but they were not enough to supply these industries, so he had the O & O lay a 6″ line to Sand Springs, and they supplied him for some time. However, when the Foster lease came up for renewal, Mr. Page went to Washington and put in an application for 100,000 acres, just north of Sand Springs in the Osage, and offered to pay a gas royalty of 3c per M. at the well. Previous to this, the royalty per annum on producing gas wells had been a flat $100 to $200 per well. At the same time, the smelters in Bartlesville and Collinsville needed more gas; and they also went to Washington and applied for large acreage on this 3c royalty basis.

In 1910 the Kansas Natural Gas Company which supplied Kansas City and other cities in eastern Kansas, laid a 16″ line south to the Hogshooter gas field and had purchased gas from the Oklahoma Natural and Caney River Companies. The smelter companies also had large lines in this field; and before 1916, the gas field was exhausted because the Kansas Natural had been taking about 100,000,000 cubic feet per day and the smelters at least 50,000,000 cubic feet.

This made it necessary for the Kansas Natural to apply for a large part of this Osage acreage. Mr. Chas. Owens, through his cousin, Senator Robert Owens, was also after 100,000 acres. He hoped to develop gas and sell to the Kansas Natural, and also to the smelters. Thus the gas acreage was in great demand, and many oil operators were also applying for oil acreage.

The Barnsdall Oil Company was the largest holder of acreage and oil production in the Osage, they having secured about 300,000 acres with fine producing leases. Mr. Franklin K. Lane was the Secretary of the Interior, under President Wilson. The war in Europe was raging and President Wilson was assuring the people that he would keep us out of war. The oil companies were selling a great deal of oil, especially to the Allies; and oil and gas properties were in demand. Mr. Lane, in Washington, was faced with the toughest proposition any Secretary of the Interior had ever faced. He started in to have open hearings, allowing every applicant to state his case and why. These hearings were many, and continued right up to the expiration of the Foster lease. Mr. George Wright was Osage Indian Agent at Pawhuska, and he had the Osage Council in Washington at these hearings for several weeks. Mr. Lane had a small committee of advisors, headed by Mr. Wright; and after all these hearings, they finally allotted this acreage according to their best judgment.

Judge Charlie Ames was our attorney. In 1910, the writer had the pleasure of introducing Judge Ames to a representative of the Texas Company, and Judge Ames became their attorney, first for Oklahoma City, and later General Solicitor. Still later he became head of the Texas Company as Chairman of the Board. In 1916, the writer also introduced Judge Ames to Mr. A. Mitchell Palmer, in Pittsburgh, Pa., and shortly afterwards Mr. Palmer appointed him an Assistant Attorney General of the U. S. Judge Ames, Mr. Braden and I were in Washington all during these hearings. We were, of course, trying to renew our gas lease of 155,000 acres, and Mr. Page was after most of this same acreage. The City of Tulsa, Muskogee and other towns in this district were dependent on this supply of gas in the Osage. The Mayors of some of these towns and communities had wired Mr. Lane not to take the gas acreage away from the Osage and Oklahoma Company, as it would impair their service. Mr. Lane was convinced that domestic service should be cared for first, before serving industries and smelters. He and his advisors favored the Osage and Oklahoma Company for that reason and the further reasons that they had pioneered the development of this acreage and had a large amount of money invested, and there was also supply enough to take care of domestic service in Sand Springs. Therefore, they allotted the lease of over 100,000 acres in the southeastern part of Osage Nation to the Osage and Oklahoma Company, and a large tract north and west of Cleveland in the Osage Nation to Mr. Page. He also allotted large tracts north to Chas. Owen and the smelters and Kansas Natural at the 3c per M. at the wells as a gas royalty. This gave the Osage Nation the highest gas royalty in the country, and naturally the Osage Council was very appreciative of what Mr. Page had done in getting this for them.

At the last hearing in Mr. Lane's office in Washington, Mr. Page was very much disappointed. He had with him Mr. Flint Moss of Tulsa as his attorney. After this map was shown and all applicants saw what they had been given, Mr. Moss took the floor and made one of his searing addresses, as only he could do, just as though he was defending a criminal case in front of a jury. In his talk Mr. Moss made a veiled threat that Mr. Page was going to take his case to Capitol Hill. It seems Mr. Page came to Tulsa from Wisconsin and was a personal friend of the Senior Senator, Robert LaFollette, and Senator LaFollette was ready to take this whole matter of Osage acreage, both oil and gas, to the Senate floor. This would have taken it entirely out of Secretary Lane's hands. Once in the Senate, there was no knowing what would have happened.

In the meantime, Judge Ames and Mr. Braden had left Washington for Oklahoma, before the final hearings and I was left alone to report back to them the final decision of the Secretary. I went out and wired Mr. Braden that we had been allotted the acreage we wanted. I hadn't any more than sent my message when I was paged at the Willard Hotel with a message to come to Secretary Lane's office at once. I went over, wondering what was up, and I was ushered into Mr. Lane's private office. He first asked for Mr. Braden, and I told him he had left for Tulsa. He put his hand on my shoulder and took me over to the window and told me Mr. Page was on his way up to the Capitol to see Senator Bob LaFollette and that this whole thing was going to be aired on the Senate floor that very afternoon. Mr. Lane said: "You know, Mr. Bartlett, those men on Capitol Hill are my bosses and they can override my decision on both the gas and oil acreage. If this gets on to the Senate floor all of these matters which I have taken into consideration will be lost, and the old Foster lease will be thrown open to the public for bids. All these oil men, as well as your company, will have to pay for your properties against outside bidders." He told me about Mr. Page's arrangement with Senator LaFollette, and said further, "there is only one thing which may be done, you must let me call Mr. Page back here at once and we will sit down and try and divide up the present acreage allotted to you, in an effort to satisfy Mr. Page (that means that your company must give up some of the western part of your tract to Mr. Page) and we will add that much to the north on your tract. If that isn't done, in the next hour, all this work of three months is lost and all your oil friends in the Osage will lose their production."

I said: "Mr. Secretary, there doesn't seem to be anything I can do but put myself in your hands, but I would like time to call Mr. Braden on the phone." He said, "No, you will

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What Is Legal Municipal Debt?

By

Leo T. Parker

Attorney at Law
Cincinnati, Ohio

For various and important reasons officials of gas corporations and municipalities may be required, at any time, to determine whether an intended obligation is a legal debt.

The higher courts have consistently held that a legal debt within the meaning of the usual State Constitution is created when an obligation is undertaken "to pay in the future for a consideration in the present." In other words, a legal debt imports a present and actual creditor as an incident to the contract or business transaction.

The latest higher court on this subject is Graham v. City of Philadelphia et al., 6 Atl. (2d) 78, reported June, 1939. The records of this case disclose that the City of Philadelphia presently is the owner in fee of the Gas Works, free and clear of any encumbrances. In 1897, the Works were leased for a term of thirty years to the United Gas Improvement Company under an operating agreement. On January 1, 1928, a new lease with the same corporation became effective subject to termination, on certain conditions, on December 31, 1937, or at any ten-year period thereafter. This lease was assigned by the United Gas Improvement Company to the Philadelphia Gas Works Company with the consent of the city. The lease provided for an annual rental to be paid to the city of $4,200,000, subject to the terms of the contract. A new lease from January 1, 1938 to December 31, 1947 was agreed on, containing the same rental provision.

At the time of preparing its budget for 1939, the City owed approximately $39,000,000 as an accrued "floating deficit," of which $5,628,428, was for outstanding capital mandamuses with interest thereon. Of this sum about $5,000,000 represents capital charges well within the debt limit, created under valid authority, which may be refunded in City bonds, notwithstanding the limitation on the City's general borrowing capacity. To retire its floating deficit, and balance the current budget, the city proposes to assign the rentals to be received by it from the Gas Works lease.

On February 27, 1939, Council amended the 1938 gas lease-agreement so as to fix the termination of the lease as of the end of the term for which the rentals would be assigned, or no later than December 31, 1958. On March 13th, the Philadelphia Corporation submitted a modified proposal, offering $50,000,000 for the assignment of the rentals covering a period of approximately seventeen years from March 15, 1939, or longer if necessary to produce an aggregate return of $73,500,000 to the corporation, with interest at 4% on rentals due and unpaid for any year. All the rights of the city under the lease are to be assigned, and the city is to agree not to dispose of, lease, or encumber the Gas Works during that time. Any insurance proceeds received by the city are to be applied to the improvement of the Gas Works within a period of six months, or paid to the Philadelphia Corporation as additional security for the payment of the aggregate return.

The modified proposal states that if, "by legislative regulation of gas rates," the amount received by the Philadelphia Corporation on August 1, 1955, shall be less than $73,500,000 the city shall levy a special tax, appropriating all the revenue therefrom to the payment of the deficiency.

The city must appropriate approximately $39,000,000, or as much thereof as may be necessary, of the proceeds of the assignment to the payment of the City's accrued deficit. The balance is to be applied to current expenses for the year 1939, and for budgetary purposes in 1940.

A taxpayer filed suit against the city to prevent assignment of the rental funds and on the grounds that assignment of rentals would effect an increase of the municipal indebtedness beyond the debt limitation, authorized by the State Constitution and State Laws. Also, it was argued that the city by selling the future rentals is disposing of future income to which it is now entitled, and is, in effect, borrowing on futures and thereby creating a debt.

Notwithstanding these contentions the higher court refused to enjoin the city from assigning the rentals, and said:

"If the city may sell or lease the Gas Works, there is obviously no impediment to the assignment of the rentals derived from the lease thereof . . . The transaction before us does not in any conceivable aspect constitute borrowing; here there is an assignment of gas rentals,—an outright sale of an obligation due the city under the lease, without any liability to the city thereon except a remote contingent future obligation to arise only upon legislative interference, which will be discussed later."

In some states the higher courts have held that legislative bodies, as municipal councils, cannot enter into a valid contract which binds those who may succeed them to office. With respect to this point, this court said:

"Whatever may be the rule in other states, it has been positively established in this jurisdiction that legislative bodies may enter into transactions or agreements binding upon their successors which may require the levying of a tax in the future. The city, in dealing with the Gas Works, is acting in a business capacity and its contracts relating thereto are binding upon future City Councils. . . .

The rentals from the Gas Works have always been regarded as miscellaneous receipts, available for current expenses. If, therefore, the rentals themselves may be used for current expenses, the proceeds from the assignment, which represent the rentals, are available for the same purpose.

Liability Not Debt

A debt, within the ordinary constitutional definition does not contemplate possible obligation accruing by Act of God or possible laws to be passed in the future. It does contemplate an existing obligation presently enforceable against the property or funds of the municipality generally, or an obligation presently existing enforceable in the future.

For example, in Kelley v. Earle, 190 A. 140, the higher court considered a lease entered into by the state for a long term which was alleged to create by implication a debt either presently or in the future. It is interesting to know that the court held that such a transaction did not create a debt, nor was any indebtedness incurred where the creditors or the trustee for the bondholders could not take the property of the municipality, or look to its general fund or other assets for the payment of the bonds.

Therefore, it is quite apparent that

a city may assume a liability and yet not incur a legal debt. Moreover, the mere fact that future laws may be enacted which would result in a transaction being a debt does not in the least change the present status of a transaction. In other words, the mere possibility that future liability may arise by reason of legislation or laws, that may be enacted, is so remote and contingent that it does not create a present debt. This is apparent, for if it were otherwise, every authorized indebtedness of a municipality would have to be considered subject to the possibility of future legislative enactment, taking from the municipality a part of its property, diverting a portion of its property to uses not taxable, or lowering assessments.

Legal Debts Illustrated

The higher courts have repeatedly held that the incurring of an obligation to be paid out of current revenues does not effect an increase in indebtedness within the meaning of the usual State Constitution and State laws. On the other hand, any act or transaction by municipal officials which has the effect of incurring an obligation to pay a fixed sum in the future and which would create an immediate debt, though not payable until a future date, is a legal debt.

For illustration, in the leading case of Keller v. Scranton, 200 Pa. 130, 49 A. 781, it was held that an assumption by the municipality of an obligation to pay unliquidated damages to the owners of property for permission to use portions of the property was legal debt. In this case the court decided that pecuniary damage positively would result, and was able to approximate the amount with certainty and therefore held that the constitutional limitation would be exceeded.

Also, in the case of Corporation, 176 A. 727, it was shown that a city was obligated to repay outstanding bonded indebtedness incurred for making certain improvements. The higher court held that issuing bonds of this nature is a legal debt.

Levy Held Invalid

An important point is that if a state law requires city tax ordinances to specify in detail the purpose of tax levies, an ordinance is void which, for instance, stipulates a lump sum to be used for a specified purpose, or otherwise fails to conform with the state law.

For example, in People v. Baltimore, 194 N. E. 569, it was disclosed that a state law requires that all city tax levy ordinances shall specify in detail the purposes for which all appropriations, to be collected from the tax levy, are made and the amount appropriated for each purpose. The objects of this requirement were to furnish the taxpayer with information as to the purpose for which taxes are levied; to enable him to compel the application of public funds to the purposes for which they were appropriated; to prevent the application of such funds to other purposes; and to prevent the raising of greater amounts than are necessary for legitimate corporate purposes.

The validity of a city ordinance was contested which levied a lump tax for the extension of a main and for other purposes. In holding this ordinance illegal, the court said:

"It is not necessary to specify every item which the city may expect to pay out of a particular appropriation. A single general purpose is sufficient to include every appropriate expenditure although there may be many items. . . . If, however, a particular item of a levy is not sufficiently definite to disclose to the taxpayer the purposes for which the money is to be expended, the levy fails to comply with the statutory requirement and is void. . . . If a lump sum levy is made for several purposes, it does not comply with the statute."

Therefore, a municipal ordinance is void if it provides for issuance of bonds or collection of taxes for more than one purpose. Moreover, legally any phrasing of an ordinance which unites a pair or more of purposes by use of the conjunction "and" is for a plurality of purposes. However, if the word "or" is used, it is generally held that the ordinance relates to a single purpose.

For illustration, in State v. Snyder, 194 N. E. 415, it was shown that a state law provides that the taxing authority of any municipality to issue bonds shall relate only to one purpose.

An ordinance was passed by a municipal council providing for issuance of bonds for the purposes of "acquiring or constructing" certain works. It was contended by certain citizens that the ordinance was for a double purpose and, therefore, that it violated the above mentioned state law and was void. However, the higher court held the ordinance valid, and said:

"The language of this section (law) is plain and free from double meaning. . . . This section expressly provides that all expenditures for any one utility shall constitute one purpose. . . . Our conclusion is that the resolution of the council providing for a vote upon the issuance of bonds does not involve a dual proposition."

On the other hand, in Elyria Water Co. v. 57 Ohio St. 374, an ordinance was held void which provided for the issue and sale of the city's bonds "for the purpose of the purchase *and* erection" of certain public works, because it involved a dual purpose in violation to a state law.

Legal Indebtedness Illustrated

As above explained any obligation is a legal indebtedness against a municipality, if such indebtedness is secured by the assets available at the time the indebtedness was incurred.

On the other hand, a city may install or improve a gas system by pledging the income until it shall pay for the system or improvements, and no legal indebtedness is created. The same rule might apply to some definite extension or improvement of a gas plant and system where the income of the extension or improvement could be separated and applied to the specified payment. However, an obligation to pay with the income of property already owned by a city is not different from an obligation to pay with any other funds, so far as the question whether the transaction amounts to a debt is concerned.

For instance, in Municipalities Systems, 148 So. 111, a municipality desired to issue bonds for extending and otherwise improving its present system. In order to provide sufficient security to the bondholders it was intended to pledge or guarantee payment of the bonds by pledging the revenue from the entire system. The legal question arose whether the bonds were a legal indebtedness, although the mortgage given to secure the bonds provides that it cannot be foreclosed and the city is not obligated to make payments except from the revenue of the entire system.

It is interesting to observe that the higher court held that bonds of this nature are a legal indebtedness against the city, saying:

"Our view is that, if the proposal is to pledge the revenue from an existing system or the system itself to the payment of funds used in making extensions or improvements, there is a debt created . . . and that the result is not controlled by the inability to foreclose the mortgage. For, if the property once owned by the city may be thereby taken out of its control and operation, and put in the control of a receiver for the bondholders and the income from its operation may be taken away from the city, such authority has the effect of creating a debt, though no foreclosure is authorized."

(Continued from page 42)

and inlet pressure (high side) variation. The intermittent device, after a period of time varying from one-half to three minutes (this time being adjustable) will again connect the automatic loading device to the regulator control, and set the outlet pressure to agree with the existing true flow and then disconnect the automatic loader. In this way the four synthetic velocities mentioned above can not cause an abnormal increase in pressure by acting on the automatic loading device. The four synthetic velocities have come to a balance, and are not increasing, but are decreasing.

If we consider now the case where many regulators feed into a common low pressure system, we see that this intermittent system just described will tend to prevent swinging, and eliminate "hogging" the load by one regulator. If simple velocity loaders, not incorporating some system such as the intermittent system just described, are provided when the load increases at one of them slightly before the others, the cumulative loading effect will tend to move the line of zero velocity from the one regulator station which gets the load first toward the other. This movement may under certain instances start slowly and due to the cumulative effect travel faster, until the regulator is carrying much more territory than it should. The intermittent device would permit the regulator to move the line of zero velocity toward the second regulator a small amount, and then pause. If a true increase in consumer demand is taking place in the territory served by this regulator, it will tend to cause the line of zero to start moving back toward its original position until the automatic loader and the regulator are again connected together for a short "reading" period. The line of zero velocity again moves away from the first toward the second regulator, until the synthetic velocity increases die down; then during a period of increasing true demand it will start back. Thus this line of zero velocity instead of starting, and due to cumulative action moving faster and faster toward the second regulators, will tend to shuttle back and forth between the two regulator stations within a small range, perhaps creeping slowly toward the second station.

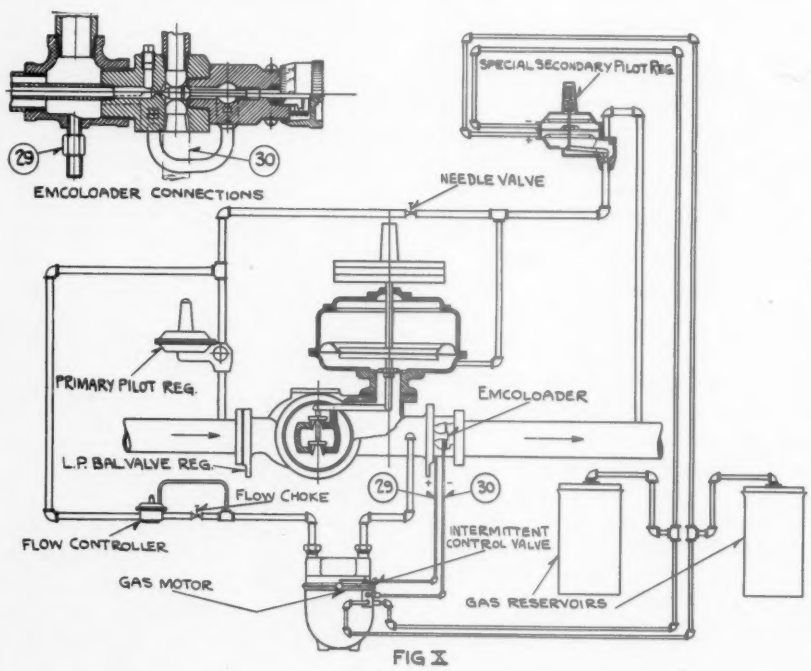

Fig. X Intermittent Emcoloader.

In most systems the load may hit one regulator before the other by a short time, yet within a few minutes the demand will also increase in the adjacent regulators. If they, too, are equipped with intermittent automatic boosting devices they will influence the line of zero velocity, moving it outward during the short period the pressure is being increased and then allowing it to drift back before the next pressure increase is made. Thus our line of zero velocity will shuttle back and forth within a relatively small distance, and each regulator will tend to keep about the same zone of influence. The cumulative effect of building up pressure with velocity is stopped, and a pressure increase based on true consumer's demand is arrived at.

The intermittent periods are adjustable to the system requirements, varying from one-half to three minutes. They must be long enough to be sure the velocity "settles down" before any further increase in pressure is made.

The actual working of the intermittent loading system in Fig. X is as follows:

In using the intermittent principle the main regulator is controlled by the well-known pilot controlling system, which provides two small pilot regulators. The primary pilot regulator is used to eliminate variation in pressure of the control system which might be caused by inlet pressure variation. The secondary pilot regulator is connected on its outlet to the main outlet system. In the ordinary working of this system any increase in the main outlet pressure above the setting of the secondary pilot regulator spring, tends to close the valve in this regulator, and increase the pressure slightly on its inlet. This increased pressure, it can be seen, works under the main regulator diaphragm to raise it against its weighting and close the valves, thus reducing outlet pressure. Conversely any decrease in main outlet pressure tends to open the valves of the secondary pilot regulator, increasing the flow through the control line. The needle valve in this control line will under these increased flow conditions have a slightly higher pressure loss and we will have a decreasing pressure under the main diaphragm. This will tend to open the main regulator valve and restore the outlet pressure. So far we have described the standard pilot controlling system.

The loading device, in this case marked Emcoloader, is of the inserted venturi type. The low pressure point in the flow stream is connected to pipe labeled 30, and the normal outlet pressure ahead of the venturi is connected to pipe labeled 29. As the rate of flow is increased the pressure difference between 29 and 30 increases. It will be noted that these pipe connections eventually arrive at the secondary pilot regulator,—29 being connected to the space above the lower diaphragm, but below the solid division plate in the diaphragm structure, and 30 being connected to the space above this plate and under the top diaphragm. Any pressure difference arising in the venturi section is thus applied to the secondary control regulator, in such a way as to increase its loading, i.e. have the same effect as screwing down on its adjusting spring. Any decrease in

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Home Service Conference & Training Course

The Home Service Conference and Training Course held in Los Angeles at the Chapman Park Hotel August 22 to 26 was well attended by a group made up of home service directors from eighteen states and included sales managers and educational people from different Pacific Coast States. A program varied in interest and attention, developed many new phases of home service operation.

Gladys Price, of the Southern California Gas Company, as Chairman of the Home Service Committee, presided most efficiently, and outlined at the start the reason for this third of the Annual Conferences, which were set up three years ago under the sponsorship of the American Gas Association through the Home Service Committee.

Mr. Norman R. McKee, Vice President of the Southern Counties Gas Company of Los Angeles, outlined the chief sales value of home service work in giving assistance to dealers, in maintaining contact with research developments in improvement and use of gas appliances and in widely varied contacts with all community interests.

Specific home service activities were discussed by directors from a number of different companies; the big picture of Home Calls was fully explained by Colleen Fowler of the Kansas City Gas Co. and was assisted in a skit of a typical Home Call by Mildred Singleton of the same company.

"Home Service Abroad"—in reality the work of home service in Honolulu, was told in a very interesting way by Pauline Edwards of the Honolulu Gas Company.

Club Women's luncheons were described by Vera Bardwell, of the Southern California Gas Company, and in another session the Conference was moved to the Payne Furnace Auditorium, where a club luncheon was served the group and a luncheon demonstration presented by Lucile Martens of the Southern Counties Gas Company.

Dealer cooperation was covered by Cleo Filsinger, of the Pacific Gas & Electric Co., San Francisco, California.

One new development of the Home Service Conference this year was the opportunity to visit different home service auditoriums to give the registrants pictures of how very attractive kitchens have been set up for demonstration purposes. A third auditorium visited was that of the Southern Counties Gas Company at Santa Monica, where Katherine Rathbone, as home service director in that office, greeted the group and where refreshments were served.

Pacific Coast Gas Assn.

(Continued from page 50)

theretofore. Under his direction an equitable plan was evolved, then personally sold to the Boards of the two Associations, and subsequently approved by their members. Today we have all of the Pacific Coast companies members of the Pacific Coast Gas Association and the American Gas Association.

"Without question the national advertising is the most important industry-wide advancement since the establishment of the A. G. A. Laboratory. James Pollard was the leader in this productive undertaking. He was the catalyst for those who were perplexed, on the one hand, and for those who demanded immediate action, on the other. He had the personal attributes to be forceful and convincing, yet pleasant. He furnished and dramatized examples of bitter electric competition to those who had not yet experienced such competition but who had been fearing it, or foreseeing it. He supplied the needed enthusiasm and tenacity of purpose during the mobilization period.

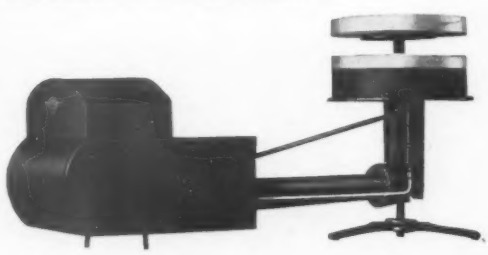
"The national advertising is now a reality and its results have been demonstrated. In addition, proponents of moves 'To Arouse the Industry' have been encouraged and permitted to mature and start other effective promotional programs. Publications, radio and other mass media have been attracted by this evidence of vitality and advertising importance, and we find their attitude changed either to acceptance of an equal footing with the claims of electric competition or to outright promotion of gas as the preferred fuel.

"Manufacturers, the utility companies, and all phases of the industry have already benefited by this epochal program, and what is more important these benefits are expected to continue. But just to make certain of this continuity, Jim Pollard is still 'in there pitching'.

"Mr. Pollard, it is a distinct pleasure for me as president of this Association to bestow upon you this high honor and to present you with the Addison B. Day Medal of Honor."

The GORDON Spreader Flame Conversion Gas Burner

Employs a New Principle bringing a New Standard of Perfection to Gas Heating. It guides gas and air in a smooth streamlike flow to the point of combustion and eliminates losses due to incomplete combustion or excess air.



The mixture of gas and primary air is led to a single burner port completely surrounded by an air nozzle. Secondary air required for combustion is projected at an angle toward the primary air-gas stream.

The result is a most effective cyclonic mixing of all gas and air right at the point of combustion.

Placed horizontally over the center of the flame, a round plate of heat resisting chromium alloy deflects the flame outward to form a flat radiant disc of fire.

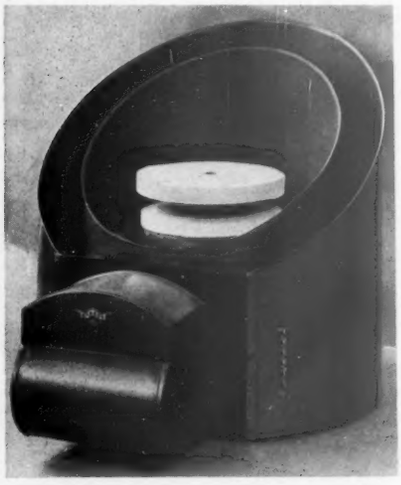
The Gordon Telescoping Mixer
In this device an Iris Orifice with simple adjustment assures close regulation of the correct amount of gas. An adjustable shutter admits the proper amount of primary air to the mixer. New bulletin with full description just off the press. Write for your copy.

Roberts-Gordon Appliance Corp.
Buffalo **New York**

New Equipment and Appliances

Conversion Gas Burner

Employing a new principle in gas flame propogation and heat distribution, the Gordon "Spreader-flame" conversion burner is announced by Roberts-Gordon Appliance Corporation of Buffalo.



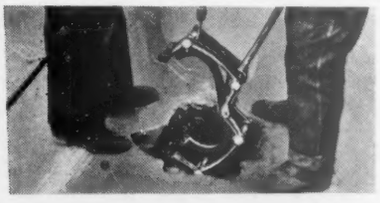
Through a single burner part the mixture of gas and primary air is carried in a stream against which is projected the secondary air at an angle. This results in a cyclonic mixing at the point of combustion. A horizontal round plate over the flame deflects it outward so that it follows up side walls of furnace or boiler.

Available with complete automatic control through use of special regulating equipment.

A new bulletin gives complete details.

New Bell Joint Clamp

Designed to meet unusual conditions and enable installation through a small opening in the pavement, the Normac bell joint



clamp has recently been introduced by Norton-McMurray Mfg. Co., 39 So. LaSalle St., Chicago. According to the manufacturers this clamp can be installed through an opening as small as one foot square, resulting in a large saving in labor costs.

The products of this company also include compression couplings and fittings, compression end cocks and meter bars, also brass fittings which employ the compression principle for copper services.

New Gas Main Cutter

A new type of gas main cutter, smaller in design, yet maintaining the same efficiency of larger and more complicated cutting units is shown here. Because it is compact, weighing only a few hundred pounds, it can be carried quickly from place to place in small trucks, and handled easily without hazard to workmen.

The idea was first developed abroad, and improvements have been made in the design from recommendations submitted by engineers of Peoples Gas Light & Coke Co. after considerable experimentation on various sized mains.

A rotary compressed-air motor furnishes the driving power for the five-inch milling wheel which does the cutting. The whole mechanism is fastened to the main by two silent-link belts. The device travels as a unit on the chain belt as the cutting wheel circumvolves the pipe. The chains remain stationary during the whole operation.

This unit, being adjustable to any size larger than 16 inches in diameter, supplants the three different sized devices formerly used. It is claimed that it will cut a 24 inch main in about 20 minutes.

Manufactured by National Machine Works, 1557 No. Sheffield Avenue, Chicago.

Clamp Fixes Porous-Welds

A special design of clamp said to be suitable for practically any working pressure or service, has been developed by Dresser Manufacturing Co., Bradford, Pa. Function of the clamp, known as style 55, is the repair of porous circumferential pipe-welds, and of small pin-holes and leaks in pipe.

Standard pipe-sizes for which the style 55 clamp is available are 1¼" ID to 26" OD.

Advantages claimed by the manufacturer include suitability for high working pressures; quick, inexpensive, permanent repairs; easy installation of the few simple parts around the pipe—under all normal pressures, without interruption of the service—using only a wrench.

The clamp is described as consisting of (1) two split (sectioned) followers; (2) a heavy, specially grooved, split gasket that fits over the weld; (3) a stainless-steel, split, gasket-retaining band that encircles the gasket; (4) a length of wire to hold the band in place during assembly; and (5) the required number of track-head steel bolts. Additional information is given in a Dresser folder, available on request.

News of the Gas Industry

A. G. A. Combined Industrial Gas Exhibit Again to Feature National Metal Show

With industrial production on the upswing, with war in the air, and with the nation's factories being equipped for ever-greater outputs, the 1939 National Metal Congress and Exposition, scheduled for the International Amphitheater, Chicago, October 23-27, offers an unusual opportunity for the industrial gas business to display its latest equipment for use by the metal industries before thousands of production men and executives who will attend the event.

To help the gas industry capitalize upon this opportunity, the Industrial Gas Section of the American Gas Association, through its Committee on Displays at National Industrial Expositions (D. W. Chapman, Chairman) will again sponsor a 5,000 square foot cooperative section at this annual national trade show of the metal-working industries. The huge gas section of the Metal Show will again be known as the American Gas Association Combined Industrial Gas Exhibit. Cooperating with the Industrial Gas Section will be the following 11 industrial gas equipment manufacturers, each of whom has been provided with a good aisle position and adequate space for displaying its most sales-winning products for use in the metal industry:

American Gas Furnace Company, Continental Industrial Engineers, Despatch Oven Company, Eclipse Fuel Engineering Company, Chas. A. Hones, Inc., The C. M. Kemp Manufacturing Company, The Paul Maehler Company, The Partlow Corporation, The Selas Company, Sellers Engineering Company, Surface Combustion Corporation.

In addition, 21 gas companies within a radius of 200 miles of Chicago have joined with the Industrial Gas Section and the manufacturers in financing the combined exhibit. These companies are:

Battle Creek Gas Company, Central Illinois Electric & Gas Company, Central Illinois Light Company, Central Illinois Public Service Company, Central Indiana Gas Company, Citizens Gas & Coke Utility, Consumers Power Company, Gary Heat, Light & Power Company, Illinois Northern Utilities Company, La Porte Gas & Electric Company, Madison Gas & Electric Company, Michigan Fuel & Light Company, Milwaukee Gas Light Company, Northern Indiana Power Company, Northern Indiana Public Service Company, Peoples Power Company, Public Service Co. of Northern Illinois, The Peoples Gas Light & Coke Company, Western United Gas & Electric Company, Wisconsin Fuel & Light Company, Wisconsin Public Service Company.

The display will be in keeping with the highest standards of national industrial exposition showmanship, and will have an overall decorative theme and color scheme, worked out by Harry Swenson, Director of Displays, The Peoples Gas Light & Coke Company, Chicago, and will include a central gas industry display and lounge which will unify the entire exhibit. Again, as in past years, the American Gas Association Combined Industrial Gas Exhibit will be the largest single unit at this biggest exposition on the metal industry calendar.

An annual feature of the gas industry's part in the Metal Exposition is the Industrial Gas Breakfast, which will be held this year at 8:30 a.m., Tuesday morning, October 24, at the Palmer House, Chicago. Its function will be to draw together the representatives of the exhibiting gas equipment manufacturer companies, all industrial gas men in attendance at the Congress, and the A. G. A. Industrial Gas Section's representatives—with the purpose of coordinating the week's effort for maximum gas industry benefit.

Still another high-spot of the week's activities in Chicago, which will be of especial interest to industrial gas men, will be the Fall meeting of the Midwest Industrial Gas Sales Council of the Industrial Gas Section, to be held at the Palmer House concurrently with the National Metal Congress, October 26. Mr. William M. Riach, Jr., The Peoples Gas Light & Coke Company, Chairmans the Midwest Industrial Gas Sales Council and promises a worthwhile schedule of papers.

CONVENTION CALENDAR

October

9 *Gas Industry Day,* — New York World's Fair.

9-12 *American Gas Assn.* Annual Convention, New York, N. Y.

19-20 *Empire State Gas & Electric Assn.* Annual Convention, Westchester Country Club, Westchester, N. Y.

23-28 *National Metal Congress and Exposition.* Exhibit sponsored by A.G.A. Industrial Gas Section included.

26 *Midwest Industrial Gas Sales Council, Palmer House,* Chicago.

30-31 *Amer. Society of Heating and Vent'g Engineers,* Fall Meeting, Atlanta, Ga.

Minneapolis Enrolls Large Class in American Gas Practice at Columbia University

During the last two months 41 employees of the Minneapolis Gas Light Company have been enrolled in the course in American Gas Practice offered by University Extension at Columbia University. This course was prepared at the request of and is sponsored by the American Gas Association. It is conducted by correspondence and has been in operation since October 1, 1925. The total number which have been enrolled in it during that time is 1987, and includes many men now prominent in the gas industry. A circular describing the course has recently been published. This circular or other information regarding the course will be gladly furnished by Mr. K. R. Boyes, Secretary, American Gas Association, 420 Lexington Avenue, New York City; or Professor J. J. Morgan, Columbia University in the City of New York.

Chemical Industry Medal

The Chemical Industry Medal of the Society of Chemical Industry will be presented to Dr. Robert E. Wilson, President of Pan-American Petroleum & Transport Company, at a joint meeting of the American Section of the Society of Chemical Industry and the American Chemical Society on November 10, 1939, with Dr. Wallace P. Cohoe presiding. The medal is awarded annually for valuable application of chemical research to industry and will be given this year to Dr. Wilson in recognition of his research studies on such varied subjects as flow of fluids, oiliness, corrosion, motor fuel volatility, clay and glue plasticity, and humidity, and in recognition of his industrial contributions in the use of tetraethyl lead, petroleum hydrocarbon cracking, and adoption of chemical engineering principles by the oil industry.

The meeting will be held at The Chemists' Club, 52 East 41st Street, New York City.

All-Gas Home Builders' Competition is Concluded with Dinner and Award of Prizes

An outstanding group of architects, builders and realtors from various parts of the country gathered at the Hotel Ambassador in New York City on August 22 to August 24 as a jury to award $10,000 in fifteen prizes in the nation-wide A.G.A. All-Gas Home Builders' Competition sponsored by the American Gas Association in cooperation with The Architectural Forum Magazine.

The competition was part of the program sponsored by the gas industry of America which recognized the fact that a revival of building will result in the construction and modernization of hundreds of thousands of homes and that these homes afford a market for all classes of domestic gas appliances. The program has been actively promoted by the gas utility industry through its fifteen hundred gas companies which serve a population of over eighty million through some seventeen million meters.

The competition was open to builders and architects who had built or modernized homes using "Gas for the 4 Big Jobs" of cooking, water heating, refrigeration and house heating during the period of from July 31, 1937 to July 31, 1939 and attracted more than two thousand registrants by outstanding architects and builders representing all parts of the United States and Canada.

The program was officially concluded at a formal dinner in honor of the distinguished jury held in the Trianon Room at the Hotel Ambassador on the evening of August 24, 1939 at which Mr. Conrad N. Lauer was guest of honor and principal speaker. It was attended by executives of the gas industry and the architectural and building professions.

Members of the jury included Otto Teegen, Director of Department of Architecture of the Beaux Arts Institute of Design and New York World's Fair Board of Design; Hugh Russell, outstanding west coast builder, Seattle, Washington; George F. Nixon, builder and realtor, Chicago, Illinois; Bernard L. Johnson, Editor of the American Builder and Building Age Magazine, and Miles L. Colean, Architectural Supervisor and Assistant Administrator of the Federal Housing Administration, Washington, D. C.

The list of fifteen prize winners were announced by Mr. Colean as chairman of the jury and are given below.

The prize winning and other meritorious designs will be on display at the Gas Industries Building at the New York World's Fair.

List of Prize Winners

$1,000 Prizes

Bissner, Harold J., 595 East Green St., Pasadena, California.

Murphy and Dean Company, 1301 Public Service Bldg., Portland, Ore.

De Bogdan, Oscar A., 1 Chase Road, Scarsdale, New York.

Bramberg, R. W., Co., 6557 W. North Ave., Oak Park, Ill.

Hughes, J. H., 316 Citizens Nat'l Bank Bldg., Abilene, Tex.

$500.00 Prizes

Brown, Homer T., 1320 Beacon St., Brookline, Mass.

Long, George W., 4411 Culver Road, Rochester, N. Y.

Wells and Merrill, 103 Park Avenue, New York, N. Y.

St. Clair, Aubrey, 119 Coast Blvd., Laguna Beach, Calif.

Lippmann, Herbert, 415 Lexington Avenue, New York, N. Y.

Breidenbach, William F., 2087 Iuka Avenue, Columbus, Ohio.

Farmer and Duran, Philtower Bldg., Tulsa, Oklahoma.

Kirkpatrick, Frank, 213 West State St., Milwaukee, Wisconsin.

Stockdale, R., 3260 Hillock Drive, Los Angeles, Calif.

Owen J. Wayland, Route 5—Canyon Road, Portland, Oregon.

A. G. A. Executive Board in Session

Executive Board of American Gas Association during their meeting at Association Headquarters, New York, on September 12th. Seated left to right—Vice President T. J. Strickler, T. R. Weymouth, George S. Hawley, C. E. Paige, Managing Director Alexander Forward, President Conrad N. Lauer, Vice President Walter C. Beckjord, George F. Mitchell, N. T. Sellman, Marcy L. Sperry, L. B. Eichengreen, Davis M. DeBard, F. M. Goodwin, D. W. Harris, Merrill N. Davis. Standing—Counsel Randall J. LeBoeuf, Secretary Kurwin R. Boyes, Otto Snyder, Treasurer E. R. Acker, H. A. Ehrmann, C. A. Tattersall, Frank H. Trembly, Jr.

J. W. Batten Director of A. G. A.

John W. Batten, Detroit, vice-president and general manager of the Michigan Consolidated Gas Co., has been elected a director of the American Gas Association. He replaces William G. Woolfolk, former president of the Michigan Consolidated Gas Company, who recently was named president of the United Light & Power Company.

Mr. Batten is a graduate of the University of Toronto, and has been in the employ of the Detroit City Gas Co., now the Michigan Consolidated Gas Co., for the past 33 years. He has been a director of the company since 1923 and a vice-president since 1931. For many years he has been an active member of the American Gas Association, and has been president of the Michigan Gas Association.

"The Index" Endorses Gas Progress

With more customers than it has served at any time in its history and with greater sales and revenues than it enjoyed in 1929, the gas industry, the oldest utility in the United States, seems to have reason to face the future with confidence, according to a survey appearing in the current issue of *The Index* published by The New York Trust Company.

Serving a total of 17,135,000 customers, or about 60% of the nation's homes, the gas industry represents a total investment in plants and equipment of almost $5,000,000,000, *The Index* states. Total sales of the industry in 1938 are estimated at $786,576,000.

"In a difficult period the (gas) industry has succeeded in expanding its market both in domestic and in industrial uses," *The Index* points out. "Through improvement of appliances it has made its product more acceptable to consumers. Confronted with changing business conditions and habits of living, the industry has shown itself flexible enough to take advantage of these changes to improve its position in a highly competitive field.

"The growth of the gas industry and its record in adverse times, therefore, indicate that with any upturn in business generally it may be expected to achieve even greater advances than those already made in its century and a quarter of orderly progress.

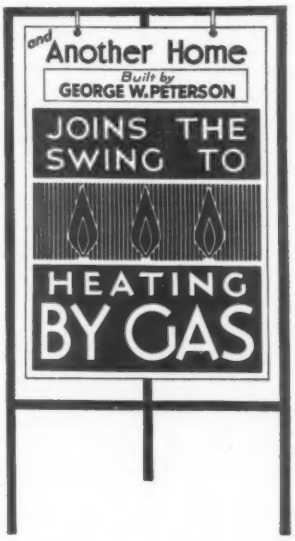
"The progress achieved by the gas industry has been made against keen competition which has confronted it in practically all its fields of use. In most of the areas served by gas, the industry's advance has been accomplished despite the availability of coal, oil and electricity and of modern devices for their use. In brief, with the gas industry, as with other forms of private enterprise in the United States, competition has fostered progress."

Metropolitan Heating and Air Conditioning Council Starts Its Eleventh Year

The first monthly meeting of the Council for the 1939-1940 business year was held on Wednesday, September 20th, at A. G. A. Headquarters. The meeting was devoted to a discussion of "Gas Heating For Low Cost Housing." Representatives of Long Island Lighting Co., Queensborough Gas & Electric Co., and Brooklyn Union Gas Company led the discussion.

The officers for the coming year are: R. A. Malony, Chairman, C. Brezee, Vice-Chairman, and H. C. Rohrs, Secretary-Treasurer.

This Council, established in 1929 for the "Interchange of Ideas Relating to Managerial Problems of Gas Heating," is entering its 11th year of useful work among its 17 member companies.



Some of its more recent accomplishments have been to originate and adopt the slogan, "Join the Swing to Heating by Gas," which later became a national slogan; prepared a set of rules (The Gasco Installation Guide) for the installation of gas winter air conditioning in new homes. This has now become a national project sponsored by the American Gas Association; prepared a booklet for the industry to refute some of the nationally circulated erroneous statements made by competition regarding a certain Long Island development.

The membership in the Council is limited to gas companies representatives and so encourages a frank discussion of the problems and the promotion of this important branch of the industry.

1939 Proceedings of N.A.R.U.C.

Many gas utility executives will be interested in knowing that the 1939 Proceedings covering annual meeting of the National Association of Railroad and Utility Commissioners, are now being printed and will be available by addressing Mr. Clyde S. Bailey, Secretary, N. A. R. U. C., Room 7411, New Post Office Building, 13th and Pennsylvania Ave., N.W., Washington, D. C., at the price of $6.00 per volume.

Gas Appliance Manufacturers Look for Increased Fall and Winter Sales

Manufacturers of gas appliances anticipate accelerated Fall and Winter selling seasons based on the constantly rising sales figures for all gas appliance lines so far in 1939, it was reported by E. R. Guyer, president of the Association of Gas Appliance and Equipment Manufacturers, following a meeting of the board of directors on Sept. 6th at the national headquarters in New York.

Mr. Guyer said that one of the outstanding developments in the gas industry during the past year was the entry of Servel, Inc., the largest American gas appliance manufacturer, into the commercial refrigeration field and also the house-heating and air-conditioning fields. Although this company has had experimental installations in operation for the past three years, this is the first year that Servel has actually gone into these fields.

Approval was given to a program for the Association's annual meeting to be held at the Roosevelt Hotel in New York on Monday, October 9th. The principal event at the annual gathering of the manufacturer members will be the election of officers and directors for the fiscal year 1939-40.

F. E. Sellman, vice-president of Servel, Inc., New York, announced the successful completion of a nationwide sales promotion campaign in behalf of gas refrigeration. The progress of the "CP" Gas Range Program was discussed by W. E. Derwent, vice-president of the George D. Roper Corp., Rockford, Ill. Increase in the sale of automatic gas water heaters as a result of an extensive campaign enlisting the support of utility company salesmen and retail plumber dealers was reported by A. P. Brill, president of the Ruud Manufacturing Co., Pittsburgh.

Conner To Receive First Honorary Award

At one of the General Sessions of the American Gas Association Convention to be held at the Hotel Pennsylvania, New York City, October 9-12, the Gild of Ancient Supplers will present its first honorary award to Raymond M. Conner, director of the American Gas Association Laboratories.

The Awards Committee of the Gild states: "The first object of the Gild is promotion of the use of gas. We feel that since the use of gas can be promoted only through gas-burning appliances, it is fitting to commend Mr. Conner publicly for his outstanding work in directing the Laboratories, with the resulting confidence in appliances bearing the A. G. A. Blue Star Seal of Approval, and in the research and improvement of appliances from year to year so that gas may be suitably presented to the public through efficient and safe appliances."

The Gild Award is a bronze statuette or bookend showing the wellknown "Gas House Terrier," a character immortalized in Walton Clark's poem, now a classic in the industry. The Award was modeled especially for the Gild by a graduate student at the Tyler School of Fine Arts, Temple University. The committee further announces that "the Award is not necessarily an annual one, but members of the Gild are deeply interested in the success of the gas industry and they believe that conspicuous service to the industry should be recognized and commended whenever the occasion arises."

Full name of the organization is the Gild of Ancient Supplers of Gas Appliances, Skills, Gins, Accessories and Substances, the initial letters forming GAS-GASGAS. Membership is limited to men of at least 10 years' service to the industry, and all Supplers are executives and representatives of business who make or distribute appliances, equipment, supplies or services to gas companies.

"Ed" Downe Joins Bryant

Edw. R. Downe

The appointment of Edward R. Downe as Chief Engineer of The Bryant Heater Company has just been announced by Bryant's Director of Research and Development, F. R. Higley. Mr. Downe was formerly Vice President and Chief Engineer of The American Gas Products Division of The American Radiator Company.

Mr. Downe brings with him to Bryant a background of 29 years of experience in engineering and designing of heating equipment. After graduating in 1910 from Worchester "Tech" he joined the American Radiator Company and was assigned to their plant in Germany, where he worked 5 years. He then entered military service as a captain in the 2nd Engineers of the famous Second Division. He rejoined the American Radiator Company after the war and was appointed Director of the Gas Utilization Department, reporting directly to the President of the company. Here he had full charge of development and production of all gas-fired heating equipment manufactured and sold by the American Radiator Company. In 1931 the American Gas Products Division of American Radiator Company was formed and he served there until recently as Vice President in charge of production and engineering.

Merle E. Abbott Rejoins Glenwood

The Glenwood Range Company, Taunton, Mass., has announced to their Gas Company customers that Merle E. Abbott, one of the country's best known men in the gas range field, is again a member of their sales organization.

Mr. Abbott is recognized in the Gas Industry as a man of outstanding ability. Having a wide knowledge of the Gas Industry's sales problems and broad experience in formulating and executing sales promotional plans, Glenwood is fortunate to obtain his services in their sales department.

Canadian News

The Central Pipe Line Co., with head office in Chatham, Ont., has made application for a franchise to supply natural gas to the village of Pt. Stanley, one of Canada's leading summer resorts. The same low rates enjoyed in the nearby town of Aylmer has been offered by the company through its solicitor.

The Ontario Government has granted a charter to Brownsville Natural Gas Products Association, with head office in London, Ont., and gas fields at Brownsville. Lee W. Adams, prominent geologist of London, is a provisional director. The board includes several prominent Ontario drillers and geologists.

St. Thomas, Ont.—In order that the coming housewives of the city shall know the benefits of gas cooking stoves, the local office of the Dominion Natural Gas Co., Ltd., has installed free of cost, a fine modern gas range in the household science department of the craft school. The Board of Education accepted the offer, the members feeling that the students should be conversant with the care and operation of gas stoves.

Norwich, Ont.—The County of Oxford Council recently gave a franchise to lay gas pipes along county roads in Dereham and South Norwich Townships. The agreement which was made with Lyle W. Kidd and William A. Coates, provides for them to lay gas pipe to supply natural gas to residents of South Norwich township and Norwich village. The gas will come from the Brownsville field near Tillsonburg. The bylaw does not give the builders an exclusive franchise. The Norotto Gas Co., which has charge of the work, has opened a salesroom and office in Norwich.

Toronto, Ont.—The eight per cent war tax recently placed by the Federal Government upon all natural gas used for domestic heating, cooking and heating, will result in a considerable increase in the cities of Ontario. In one of the smaller cities, it is estimated that the gas users will contribute between $10,000 and $15,000 during the coming twelve months. Electricity has been taxed a similar amount.

Montreal.—Hugh MacKay, K.C., and R. A. C. Henry were appointed directors of Montreal Light Heat & Power Consolidated at a meeting of the board held September 18th. These appointments fill the vacancies created by the death of the late Julian C. Smith and the late Sir Charles Gordon.

The Board of Directors declared the regular quarterly dividend on the no-par-value common stock of thirty-seven cents per share (being at the rate of $1.50 per share per annum) payable October 31, 1939 to shareholders of record, September 30, 1939.

This is the ninety-third consecutive quarterly dividend declared by the present company.

With Merco Nordstrom in Southwest

A. A. (Andy) Fomilyant, who formerly was in charge of field editorial work for Western Business Papers, Inc., recently became associated with Merco Nordstrom Valve Company and Pittsburgh Equitable Meter Company in sales engineering work. Mr. Fomilyant received his engineering education at Cal-Tech. He is in the above company's Los Angeles offices, covering primarily the refinery field.

A. A. Fomilyant E. M. Cloran

E. M. (Mike) Cloran, formerly in the Engineering Department of the Pittsburgh Equitable Meter Company and Merco Nordstrom Valve Company in Pittsburgh, was recently transferred to the company's Los Angeles office. He will handle sales engineering duties, chiefly contacting gas and petroleum departments of Southern California corporations. After graduation from Harvard ('28) he became associated with Stone & Webster and later was with Atmospheric Nitrogen Corporation. He is a member of the sub-committee on Industrial Instruments and Regulators of ASME.

Servel Annual Sales Meeting

The annual sales convention of Servel, Inc., is being held in New York City beginning October 5, to continue through October 8, at the Hotel Roosevelt.

This is a precedent, the conference in other years having been held at Evansville, Ind., where the company's main offices and plant are located, or at such places as Hot Springs, Va., or French Lick Springs, Ind. New York was chosen this year to tie in with activities at the New York World's Fair where Servel has an exhibit in the Gas Industry's building. The convention will immediately precede the annual convention of the American Gas Association.

Gas Masks. A bulletin on the "Care and Use of Gas Masks" is being distributed by the Davis Emergency Equipment Company, 55 Van Dam Street, New York City. This bulletin is of interest to all concerned with the respiratory protection of workers. It covers the important points to be observed in selecting, testing, using, and caring for the several types of gas masks used in industry and their accessories.

"Ring the Bell" to Sell Servel

The annual Fall and Winter campaign for the sale of Servel Electrolux gas refrigerators began a month earlier this year, having started October 1, to last until the end of the year, it is announced by George S. Jones, Jr., vice-president and general sales manager of Servel, Inc.

In announcing the three-month campaign in which the sales forces of its accounts in both the urban and utility fields, numbering several thousand salesmen in all parts of the country, will compete for cash awards to those who make the highest records, Mr. Jones stated: "The Fall and Winter sales contests conducted by Servel, Inc., following the regular seasonal selling period in the Spring and Summer, have grown in importance from year to year. The holding of such contests is in line with the company's 'all-year-round' selling policy which goes back to the period when the Servel Electrolux gas refrigerator was introduced to the public over twelve years ago.

"Year by year, the public acceptance of gas refrigeration has grown apace, and with that acceptance there has been an increasing demand for all-year-round refrigeration on the part of the housewife.

"The selling campaign which began on October 1, was staged by the promotion department of Servel to create an even greater enthusiasm on the part of gas appliance salesmen than they have shown in successful Fall and Winter selling drives of other years.

"The promotional plans in connection with the campaign provide for cooperative activity on the part of Servel accounts with a view to making sales records during the last quarter of 1939, the highest in the history of gas refrigeration.

"As house-to-house canvassing is an important factor in retail selling of automatic refrigerators, the salesmen who will compete for awards are urged to ring in the aggregate 'one million door-bells' as a way of acquainting themselves with those families throughout the nation who are in the market for a new refrigerator. This market consists of those who are still using the old-fashioned ice-box or those who have an automatic refrigerator that has become obsolete from years of use.

"With 'ring the bell for gas refrigeration' as a slogan, contestants will have the assistance of the sales promotion department as well as the advertising department of Servel, Inc., with advertising in leading national magazines, trade journals and in local newspapers in cities and towns where the Servel Electrolux gas refrigerator is sold."

Maintaining Present Prices

A pledge to maintain its present prices as far as possible and to resist any inflationary moves through unjustified price increases, has been announced by James F. Lincoln, President of the Lincoln Electric Co., Cleveland, O. Mr. Lincoln expressed hope that other business men would adopt a similar position. He further states that if materials and labor costs are increased, then the selling price will be raised to just cover the increased costs.

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Spiral Welded Pipe. "Opportunities for Savings in Gas Gathering Lines" is the title of an attractive folder in color just issued by the Pipe Sales Division of The American Rolling Mill Company, Middletown, Ohio. Interesting field photographs show simplification of difficult bending jobs, handling of pipe in long, uniform lengths, and strength, flexibility and easy welding of this product.

Other advantages of this pipe are said to be savings in material cost, greater accuracy in estimating costs, prompt delivery, shorter installation time and adaptability to various joints and fittings. Copies of the folder may be obtained from the Pipe Sales Division, The American Rolling Mill Company, 509 Curtis Street, Middletown, Ohio.

PREPARED

With 600,000 bu. of GPM IRON HYDROXIDE purification material always stocked for immediate shipment, and our modern 9 acre plant geared for increased production on short notice, *we are prepared to meet any oxide emergency.*

Gas Purifying Materials Co., L. I. City, N. Y.

A Book for Gas Appliance Salesmen

Domestic Gas Appliances by A. M. Apmann. Gives practical working knowledge of the technology of appliances and characteristics of fuels. Ranges, Water Heaters, House Heating and Refrigeration are fully discussed. 238 pages, many illustrations, stiff cover. Special close-out price, 50c. American Gas Journal, 53 Park Place, New York.

Gas Executive Available

Experienced Gas Executive wishes connection. Will furnish satisfactory references. Southern States preferred. Address Box 113, c/o American Gas Journal, 53 Park Place, New York, N. Y.

Service Man Available

Experienced Service Man now employed with Utility desires new connection with Gas Company. Twenty-four years old, three years' experience with sales and service department. Address Box 114, c/o American Gas Journal, 53 Park Place, New York.

Loading Distribution Systems

(Continued from page 68)

flow through the main regulator will cause a smaller pressure difference between 29 and 30, this resulting in a smaller loading of the secondary control regulator, and thus a lowered main outlet pressure. In this way we can accomplish conventional automatic loading, i.e. increase outlet pressure in proportion to rate of flow.

To do this intermittently, at predetermined intervals, we provide a gas motor, actually built from a standard cast iron domestic meter. A flow, held to a constant rate by a small flow controller, is established from the outlet of the primary regulator (merely because it is a convenient source) through the meter-motor and on to the outset side of the main regulator. On the gas motor a pair of valves is connected, one in line 29, and one in line 30. At periods, determined by the motor's speed, the valves are simultaneously opened by a cam and then immediately closed. During this open period the pressure difference of the venturi section is applied across the diaphragm of the secondary pilot regulator, and will thus load it in accordance with the existing velocity through the venturi section. The valves close after but a few seconds, and the loading of the secondary pilot regulator can not change until the valves are again opened by the motor. This closed period can be varied from one-half to three minutes. As explained elsewhere, the period during which the valves are closed, gives time for the synthetic or false velocities occasioned by increasing pressure to reach a constant value, so that when the valves are again opened by the motor, true velocity conditions are maintained. The gas reservoirs shown provide a large volume so that the valve of the secondary control regulator will be free to move as this regulator performs its job of maintaining the main outlet pressure to that value for which it has just been set. These reservoirs also minimize the importance of small leaks that might exist in the piping from the venturi section to the secondary pilot regulator.

We have gone into the matter of pressure control and automatic loading rather thoroughly. The need for automatic loading devices in many systems is pressing. Unsatisfactory consumer pressure conditions, high leakage and unaccounted for gas, because high pressure must be carried to insure sufficient pressure at the low point during peak hours, are sore spots in distribution system operation. We have tried to bring out here that automatic loading equipment, even the best obtainable, must be applied with due regard to the system, and to the location of adjacent regulators. Also automatic loading accomplished by any of the velocity systems often tends to be unstable. Many times "swinging" and "load hogging" are experienced to the extent that automatic loading can not be applied without an undue amount of supervision. Quite often it is the loading and regulating equipment that is blamed for this trouble, when it is in reality the adaptation of this equipment to the system which is at fault. The method offered here as a cure, the intermittent system, is probably only one of the possible solutions of this problem; there may be other satisfactory ones. This intermittent loading system, however, has been applied successfully in several locations where the ordinary velocity operated system would not work. It is believed that with this automatic loading method practically any problem of pressure regulation in a distribution system can be met. It is even possible to apply automatic loading to some regulators in a system, leaving the others as straight constant pressure regulators. While this problem is somewhat more complicated, the intermittent principle will tend to cancel the cumulative effect of velocity loading and prevent swinging or "load hogging." The intermittent principle at least provides a possible solution for difficult cases.

Handbook of Building Maintenance

A Handbook on building maintenance has been published by Flexrock Company, 23rd and Manning Streets, Philadelphia, Pa.

It goes into such subjects as the proper maintenance of roofs, floors, some construction, information about cleaning and a few other general subjects of that kind.

About 200 pictures, diagrams, mechanical drawings and art drawings assist in explaining many of the details concerning the application of materials, what to expect after using such materials and what types of materials provide the best jobs under specific conditions.

This book will be of service to those who are not technically trained and it will add many profitable ideas for those who are. It is sent free of charge.

History of Natural Gas in Oklahoma

(Continued from page 65)

not have time to call Mr. Braden. I am sorry he left Washington." He said: "Shall I call Mr. Page—I think he is in Senator LaFollette's offices now." He had a call put in for Mr. Page and in a few minutes Mr. Page came in. In the meantime, Mr. Lane and I decided on a plan of division and he said, "Mr. Bartlett, I like the way Judge Ames and yourself presented your case at these hearings and I will help you all I can." We sat down at Mr. Lane's desk with the map and started at a point midway between Tulsa and Sand Springs, along the southern boundary of the Osage Nation. We drew a line one mile north and then a line one mile west and continued a staggered line in this manner north and west through this 200,000 acre tract. Our company landed with the east half and Mr. Page with the west half. Mr. Page drilled some gas on this tract and laid a line to Sand Springs, and, as far as I know, may still be getting some gas from this acreage. It developed that our company had 160 acres of developed gas on Mr. Page's half. Mr. Page wanted this gas as it was right north of Sand Springs, but the Secretary held out against Mr. Page and this piece was included in our lease. Mr. Page finally agreed and we all left the Secretary's office. I then had to wire Mr. Braden the change, and of course we were somewhat disappointed, but I have always had the feeling that I saved all the other gas interests and all the oil producers their developed acreage by that compromise.

Mr. Page wired that very afternoon to General Electric Company for $100,000 of electric machinery for his electric light and power plant, which is still running at Sand Springs.

Mr. Barnsdall was the one who sustained the greatest loss on the reallottment of the oil acreage, as he was only allowed his developed acreage and had to turn back nearly 300,000 acres, which the Osage Nation began to sell, with other acreage, at the famous lease sales in Pawhuska, which sales have continued intermittently until the present. The Osages have realized millions of dollars from these public sales.

(Part 3 concluding this article will appear in November issue.)

HUGHES PRINTING CO.
EAST STROUDSBURG, PA.